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BY JOHN B. FISKEN.

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METERING DIRECT CURRENT POWER WITH CURRENT TRANSFORMERS.
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THE FERRIS WATER POWER BILL.

SPECIFICATIONS FOR WESTERN RED CEDAR POLES.

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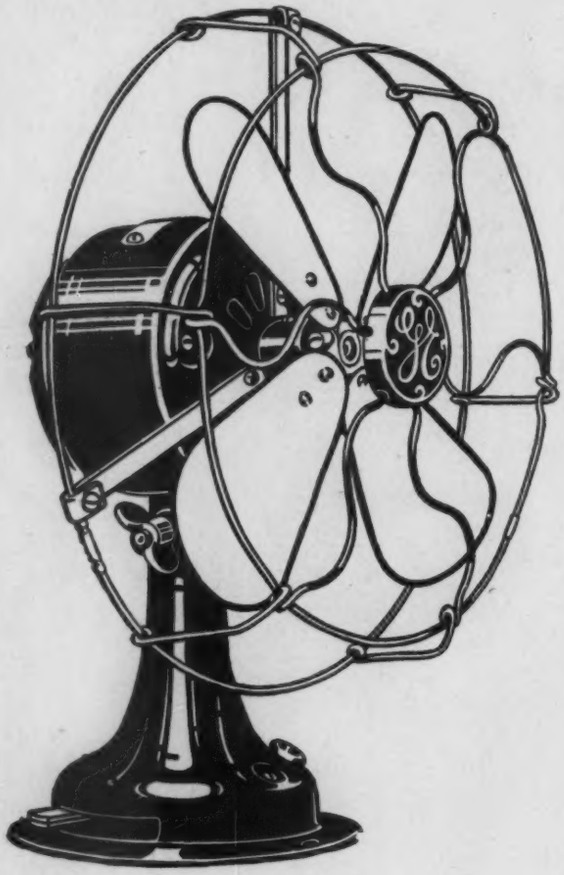

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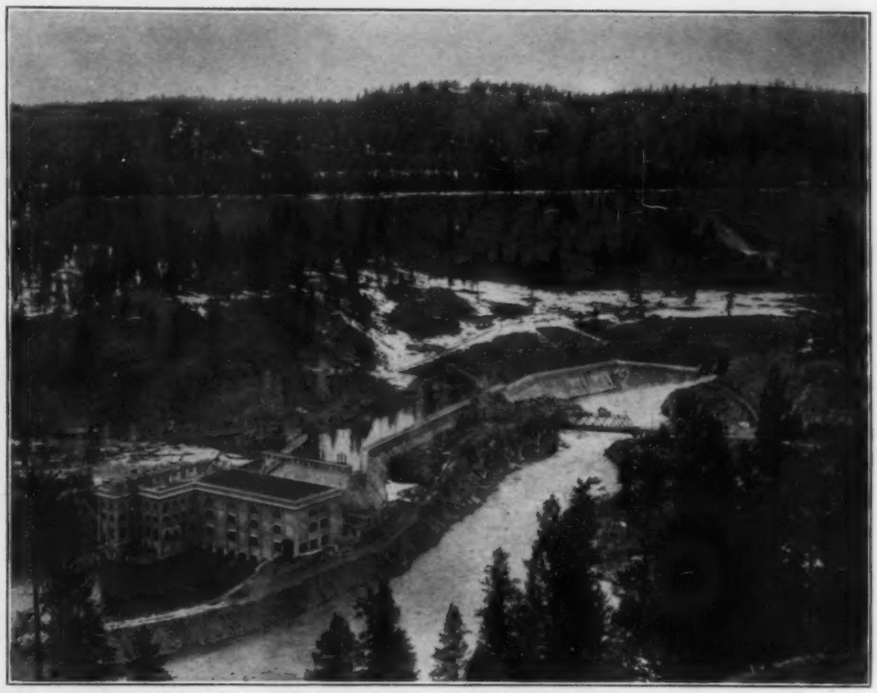
LITTLE FALLS TIE LINE

BY JOHN B. FISKEN.

(This article constitutes a valuable contribution on the subject of transmission line construction. The particular line is carefully described, reasons being stated for the choice of materials and methods employed. Details of the construction work are also given. The paper was presented in full by Mr. Fisken at the Engineers' Convention held at Moscow, Idaho, January, 1914.—The Editors.)



View of Little Falls Power Station, Washington Water Power Company.

It is not the intention of the author to submit an academic treatise on the theories and formulae involved in designing transmission lines, but to offer in a simple manner a description of the Washington Water Power Company's Little Falls Tie Line, the only steel tower transmission line in the Inland Empire.

What is known as a "Tie Line" is a line connecting two or more power plants or substations in contra distinction to a "Distribution Line" which distributes power to the consumers. A transmission line properly speaking is any line which transmits electric power, but common usage has limited the use of the term to high tension lines, a limitation which, in the author's opinion, is wrong.

Reason for Building the Line.

Little Falls is situated on the Spokane River about 45 miles below Spokane, and in 1910 the company put in commission a power plant erected at that point. This plant has a capacity of 20,500 kw. and except for that which is used in the Big Bend country all of this power has to be transmitted to the Twenty-ninth avenue substation at Spokane, where part of it is transformed for use in Spokane, while the balance is distributed in conjunction with the power generated at Post Falls over the various 60,000 volt distribution lines.

The Circuits.

There are two circuits each having a transmission capacity of 12,500 kw. with power losses and regulation as follows:

Line Drop and Losses.

Power Factor, per cent.	Power Loss, per cent. 12,500 kw.	25,000 kw.	Line Regulation Drop, per cent. 12,500 kw. Leading	12,500 kw. Lagging	25,000 kw. Leading	25,000 kw. Lagging
100	3.05	7.1	3.2	...	7.1	....
95	....	...	1.	5.5	2.7	11.4
90	3.75	7.5	zero	6.5	0.6	13.4
80	4.7	9.4	...	8.4	...	....

The above figures may be and no doubt are off a small fraction of one per cent as they were scaled from a diagram and not calculated.

The loss at 25,000 kw. might appear somewhat excessive but one circuit is only intended to carry that load in case the other should for any reason be out of service.

The Voltage.

A transmision voltage of 60,000 volts was decided upon, as the company has an extensive system of distribution lines operated at that voltage and it was consid-

ered very desirable to connect the Tie Lines with the distribution lines without interposing any transformation. While the amount of power transmitted is large the distance is short and a voltage of 60,000 permit-

View of Twenty-Ninth Ave. Substation Showing Incoming and Outgoing 60,000 Volt Lines and Outgoing 13,200 Volt Lines.

ted the transmission of the power over conductors of reasonable size with reasonable loss.

The Conductors.

The question of copper or aluminum, to be used for conductors was given full consideration, the decision being in favor of the latter. One of the objections urged against aluminum was that the metal being soft the conductors would have to be handled very carefully as they would be liable to be seriously damaged if they should be pulled over rough rocks. To prove or disprove this claim a length of about 1000 ft. of cable of approximately the size which would have to be used was secured. On the right of way of the Medical Lake Railway a place was found where numerous jagged rocks and rough boulders stood above the surface of the ground; a team of horses hitched to one end of the cable pulled it back and forth twice over this ground without any attempt being made to protect it from the rocks. An examination of the cable, after it had finished its journey, showed practically no damage; the outer surface was scratched, but no cuts or dents liable to weaken it could be found. A comparison of the two metals is shown in the following table:

Comparison of Available Conductors.

	Aluminum.	Hard Drawn Copper.
Specific gravity	2.68	8.93
Relative specific gravity	1.00	3.33
Conductivity (Mattheissen Standard Scale)	61 to 63	96 to 99
Tensile strength per sq. in.	26,000 to 30,000	55,000 to 65,000
Elastic limit, about	14,000	30,000 to 35,000

If we assume a conductivity of 97 for copper and 62 for aluminum we get a ratio of 1:1.565 or in other words a copper wire of 100,000 c.m. is equal in conductivity to an aluminum wire of 156,500 c.m.

As shown in the table the relative weights of aluminum and copper for the same section are 1 and 3.33 and for the same conductivity we get $\frac{1.565 \times 1}{1 \times 3.33} = .47$.

Or in other words the weight of an aluminum conductor per 1000 ft. is 47 per cent of the weight of a copper conductor per 1000 ft. having the same conductivity. Inasmuch as it is necessary to use a larger cross section of aluminum in order to obtain equal conductivity with copper, it is also necessary to take this increased size into consideration in determining the relative breaking loads.

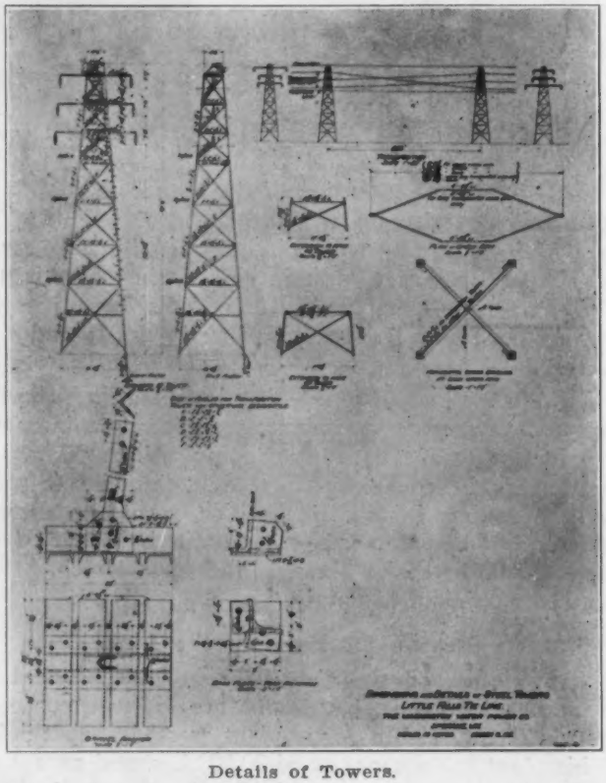
Assuming a unit strength for aluminum of 24,000 lb. (the strength provided for in the specifications for the conductors used in this line) and for copper 60,000 lb. the relation of the two conductors becomes

$\frac{1.565 \times 24{,}000}{1 \times 60{,}000} = \frac{37560}{60000} = .62$, i.e. an aluminum conductor has only 62 per cent of the strength of a copper conductor of the same carrying capacity. Fortunately the load which the conductors on this line have to carry can be carried safely by the aluminum and advantage can therefore be taken of a lighter conductor. Since this line was constructed, steel cored aluminum cables have been put on the market and have been used with great satisfaction by several power companies. The steel cored cable is much heavier for the same conductivity but has a very much higher tensile strength than hard drawn copper.

The conductors used have a cross sectional area of 270,000 c.m. consisting of 19 strands, an elastic limit of 14,000 lb. per sq. in., an ultimate strength of 24,000 lb. per sq. in. and weighs 1315 lb. per mile.

The Towers.

In a distribution line where the amount of power to be transmitted is small and where owing to the



Details of Towers.

revenue being in proportion the cost must be kept down in order that the line may earn a dividend, cedar poles have to be used. Cedar poles however are very inflammable and are easily set on fire. A spark from

a brush, timber or other kind of fire settling in a weather crack is liable in dry weather to start the pole smoldering and once started it will continue to smolder or burst into flames and the result is a burnt off pole. A leaky insulator may start a fire in a pole top or the charging current due to the insulator acting as a condenser may do the same with the result that when the pole top is burnt off the wire is allowed to fall and cross with other wires of the circuit. These are perhaps the principal reasons why the conductors of Tie Lines such as the one we are considering are usually supported on steel towers

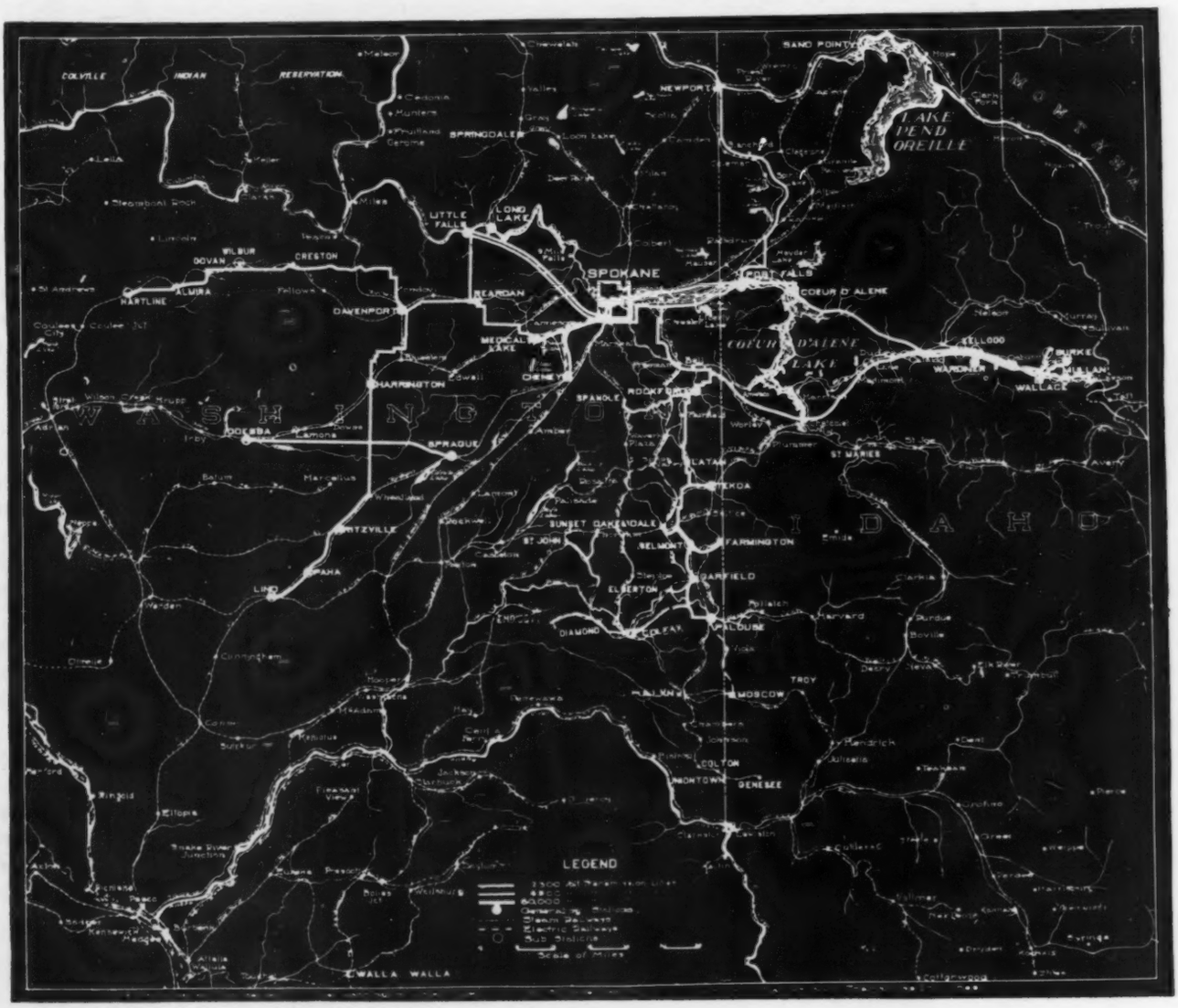
The generally accepted type of tower at the time this line was designed was that having two circuits, one on each side of the tower, the conductors of each being in an approximately vertical plane. That was the type adopted in this case.

The specifications called for a tower to resist the following stresses. Each cross arm a horizontal strain, in any direction, of 5000 lb. and a vertical strain of 1000 lb. each applied at the end of the crossarm. Each ground wire support a horizontal strain in the direction of the line of 8000 lb. and a vertical strain of 1000 lb. Each tower the overturning moment due to a horizontal strain in the direction of the line of 5500 lb. applied at either ground wire support; also a horizontal strain in any direction of 3000 lb. applied at the point of support of any three of the conductors.

Each tower the overturning moment due to a horizontal strain in the direction of the line applied at each ground wire support of 5000 lb., also to a horizontal strain at right angles to the line applied at each ground wire support of 5000 lb.; also to a horizontal strain in the direction of the line applied at the intersection of the middle cross-arm and the center line of the tower of 9000 lb., and simultaneously a horizontal strain at right angles to the line applied at each of the points of support of the six conductors and two ground wires of 500 lb.; also to a horizontal strain either at right angles or parellel to the line applied at the center of gravity of all the wires of 12,000 lb. Accompanying the above mentioned horizontal stresses a vertical strain applied at the supports of each of the six conductors and two ground wires of 500 lb.

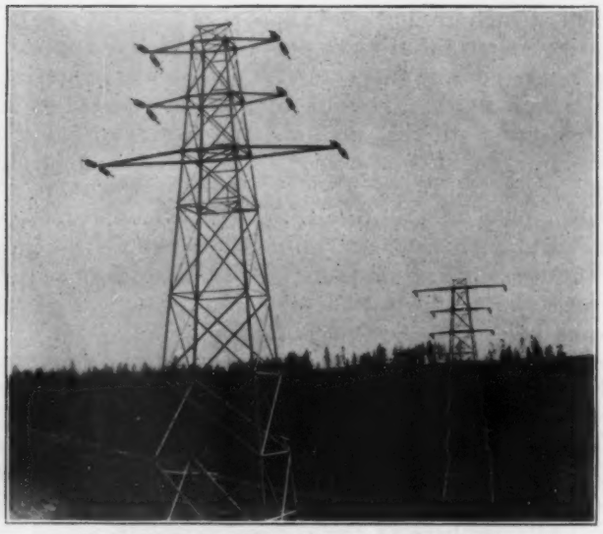
The stresses due to its owns weight and to a wind pressure in a horizontal direction of 20 lb. per sq. ft. on the superficial area of the tower.

All members of the towers were galvanized and bolted together. The standard tower is fifty feet from



Map Showing 60,000 Volt Lines of the Washington Water Power Company.

the ground stub joint to the bottom wire at the insulator and 192 of these towers weighing 5324 lb. each were used. In addition there were 10-40 ft. towers 4315 lb. each, 10.60 ft. towers 6390 lb. each, and 16

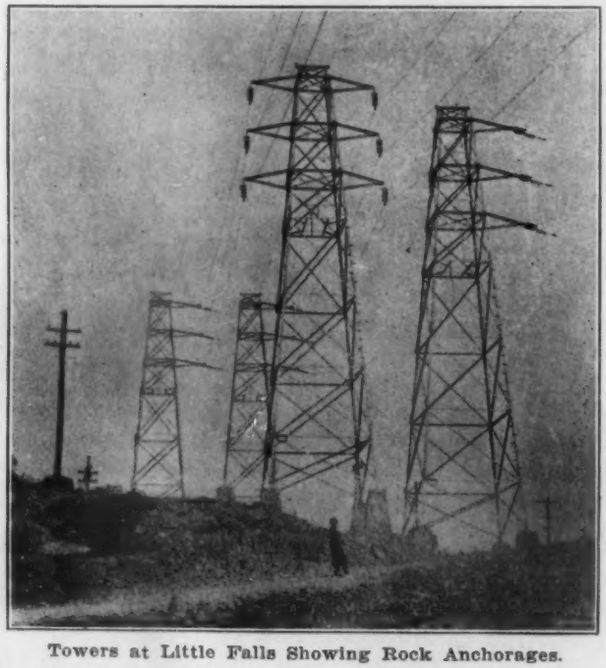


View of Tower Line Showing Transposition.

transposition towers 6467 lb. each. The line is transposed through 120 degrees eight times giving three complete cycles, and two towers are required for each transposition.

One hundred and eighty-five towers had anchor posts set in dirt and 43 anchor plates resting on concrete footings but anchored through the footings to solid rock by means of wedge holding down bolts.

The work of manufacturing the towers was done



Towers at Little Falls Showing Rock Anchorages.

under the supervision of an inspector employed by the purchaser, who kept a close supervision of the workmanship and made frequent tests on samples selected by him. One of the 50 ft. towers was erected at the contractor's works for inspection and to prove the correctness of the design was subjected to all the stresses provided for in the specifications.

Ground Wires.

Two ground wires are provided and they are attached both mechanically and electrically to the top of the towers. Each ground wire consists of a ⅜ in. diam., seven strand Siemens-Martin steel cable having an ultimate strength of about 9000 lb. and an elastic limit of 5500 lb. These ground wires are provided to afford protection from lightning discharges. Whether they do or do not furnish this protection the author is unable to state, from his own experience, but believes that they do. Many engineers claim that owing to the ground wires in each span together with the towers and the earth forming a closed circuit they thereby tend to choke down any high frequency surges that may come on the line. If this theory is correct and it probably is, then the ground wires are performing a duty beyond what was expected of them. In the design of the towers no consideration was given to the value of the ground wires acting as guys. The author believes this should be done and if it is the weight of the towers would be materially reduced.

Insulators.

It is generally conceded by engineers that on account of the potential gradient 60,000 volts is about the dividing line between pin type and suspension type insulators, though there is by no means a complete unanimity on this point. However, apart from the question of potential gradient there are mechanical features that make the suspension type the better one for use with long spans.

Before deciding on the type of insulator to be used, V. H. Greisser, electrical engineer of the company, and the author were privileged, through the courtesy of the Butte Electric & Power Company, to witness and participate in tests of a number of different types of suspension insulators. As a result of data gathered from these tests the Ohio Brass type of insulator was adopted for use on this line. Each suspension consists of four units and each strain insulator of five units.

The specifications provided that the insulators should have all corners both of the porcelain and the hardware to be rounded off and be smooth; the design was to be such as to prevent internal strains during the process of cooling of the porcelain; and all porcelain was to be completely vitrified and except where the porcelain surface was to come in contact with cement was to be glazed with a slate glaze.

The hardware was to be cemented to the porcelain with a good quality of neat Portland cement or concrete made of one part Portland cement and not to exceed one part of clean sharp sand.

The specifications called for the following inspections and tests:

1. Design tests on a limited number of insulators (not over one per cent of the total) to determine their ultimate mechanical and electrical strength consisting of

A. Mechanical inspection of separate parts.
B. Electrical tests of separate parts.
C. Mechanical inspection of assembled insulators.
D. Electrical tests of assembled insulators.
E. Mechanical tests of assembled insulators.
F. Special tests which might be decided upon later.

2. Acceptance tests on all insulators consisting of:

G. Mechanical inspection of separate parts.

H. Electrical tests of separate parts.

E. Mechanical inspection and tests of assembled insulators.

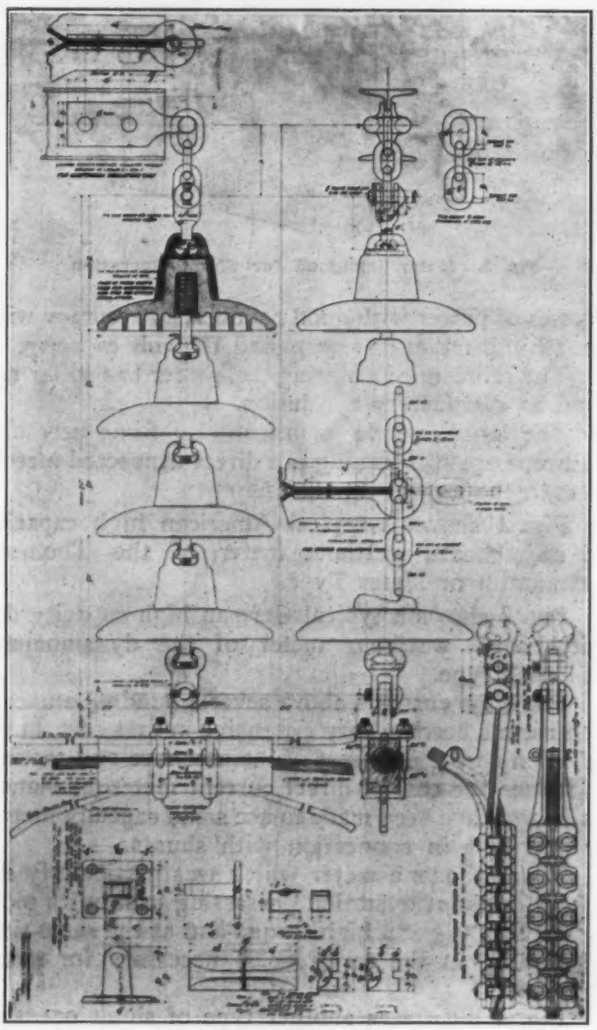
J. Electrical tests of assembled insulators.

The specification went into very full details as to how these tests were to be made, but a summary, for four units to a string is as follows:

Dry test over 250,000 volts.

Wet test over 178,000 volts.

Ultimate tensile strength 10,000 lb.



Details of Insulators, Clamps and Arcing Rods.

It will be noted that this gives a factor of safety against flashover wet of considerably over two.

Cable Clamps.

The question of a suitable cable clamp was given full consideration and the clamp finally adopted was one designed by R. A. Willson, general superintendent of street railway system of the company.

The clamp, a patent for which has been issued, consists of two hard wood blocks, dipped in oil and lamp black, which by means of two clevises clamp the wire.

This clamp offers several advantages over the all-metallic clamp. There is practically no chance of injuring the cable, when tightening up the clamp, as the wood blocks only, with the exception of a thin aluminum strip, come in contact with it. The clamp can be adjusted so that the cable, should it be subjected to a stress in excess of the elastic limit will slip through; by thus pulling through of the cable the stresses on the tower will be materially relieved in case a cable should break. The aluminum strip above referred to is intended to keep the insulator hardware to which the clamp is attached at the same potential as the cable and prevent burning of the wood. The rod shown on the top of the clamp is an iron arcing rod provided to take the arc in case of a flashover and thus prevent the cable being burned off, the lower arcing rods were omitted.

[To be continued.]

POLE TIMBER POSSIBILITIES AND PREJUDICE.

Lodgepole pine, of which there are abundant stands in both the Rocky Mountain and Coast ranges, when treated with preservatives ought to serve with red cedar as a pole timber, says the department of agriculture in a bulletin just issued on Rocky Mountain woods for telephone poles.

The rapid extension of telephone and power lines in the west is making the question of pole supply one of increasing importance. Western red cedar, for long the standard pole timber of the western states, grows only in Washington, Oregon, and northern Idaho, and in the states south of that region its cost is much higher, owing to the great distance over which it must be transported. In addition, the heavy drain on the supply promises to result in increasingly higher prices.

The tendency of lodgepole pine to decay rapidly when in contact with the ground has so far kept it out of the field as a competitor of the cedar, but the general adoption of preservative treatment by railroad and telephone companies changes the situation. At an additional cost for treatment that still leaves the pine pole the cheaper of the two in most markets outside the cedar region, states the department, the pine may be made to last longer than untreated cedar. Tests carried on at the forest service laboratory also showed lodgepole pine to be as strong as the cedar, if not actually stronger.

Fire-killed lodgepole pine, of which there is a vast quantity in the Rocky Mountain region, showed a strength under test 80 per cent that of live red cedar. In elastic values, the two were practically equal, and in stiffness, fire-killed lodgepole pine is quite comparable to the cedar. The prejudice against the use of fire-killed material is a mistaken one, says the department, for there is no inherent difference in wood seasoned on the stump and wood cut when green and then seasoned. On many areas such material remains entirely sound for a number of years after the fire which killed it and besides is thoroughly seasoned and thus ready for preservative treatment as soon as cut.

Engelmann spruce is another Rocky Mountain tree which the department suggests might be used for poles. It is not as strong as lodgepole pine, nor does it take preservative treatment as well, but it grows farther south, and in many districts is the only local timber available for pole use.

METERING DIRECT CURRENT POWER WITH CURRENT TRANSFORMERS.

BY OTTO A. KNOPP.

The metering of electric power has been a matter of great importance since the first days of electric power distribution. It has been an international engineering problem, engaging some of the keenest minds in the engineering world.

The successful solution of the problem is also a matter of great financial importance, which is better understood when it is learned that the expense incurred by an electric distribution company through

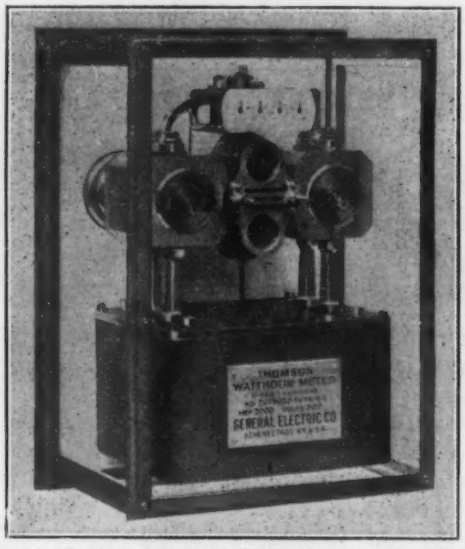


Fig. 1. Typical American High Capacity d.c. Meter.

their metering equipment is on par with the cost of the total generating equipment.

The problem may be divided into two distinct classes. The metering of alternating current power

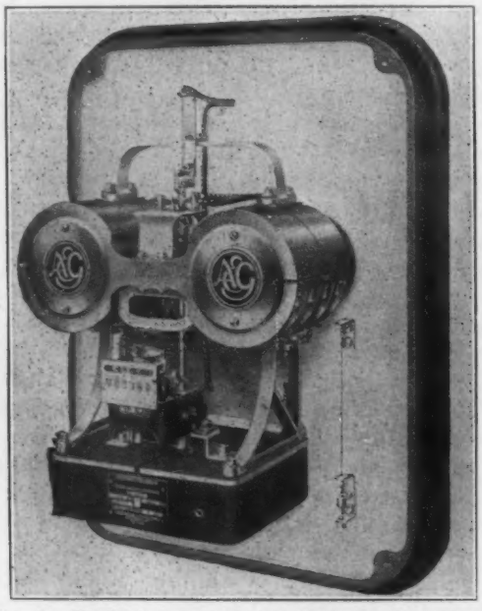


Fig. 2. Typical German High Capacity d.c. Meter.

and that of direct current power. The first problem has found in recent years a most satisfactory solution for all classes of service in the development of the small and inexpensive induction type meter in connection with the current and potential transformer. The induction meter proper is used ordinarily for small currents up to 400 or 500 volts pressure; for large currents and higher potentials, the current and potential transformer is used making it possible to meter large

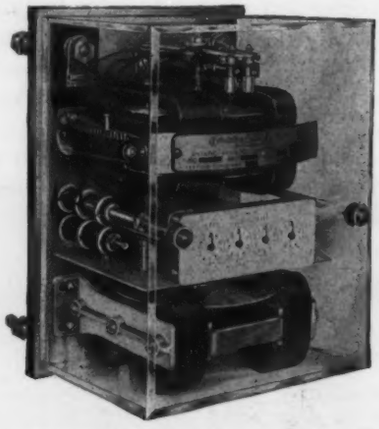


Fig. 3. Meter Designed for Shunt Operation.

volumes of power with good commercial accuracy with a small unit meter of 5 amp. and 110 volt capacity.

The problem of metering d.c. power has so far not found as satisfactory a solution.

The large electric manufacturing firms here and in Europe are still turning out direct connected meters for even the largest capacities.

Fig. 1 shows a typical American high capacity d.c. switchboard watthour meter of the Thomson Commutator or Meter Type.

Fig. 2 shows a typical German high capacity d.c. switchboard watthour meter of the dynamometer oscillating type.

For large currents above several hundred amperes such meters become very expensive in first cost, in installation cost and in cost of maintenance and testing. To reduce the cost of direct current metering numerous efforts have been made to use small capacity meters for operation in connection with shunts.

Fig. 3 shows a meter which was particularly designed for shunt operation possessing iron in its moving element to get a high torque and at the same time a low drop in the series fields necessary for shunt operation.

Fig. 4 illustrates another type of shunt operated meter with the particular feature of a four pole field.

Fig. 5 illustrates a meter which is naturally fitted for shunt operation; it is a mercury type meter possessing a very low drop in the series field. It has been used advantageously not only for small installations, but practically for the very largest direct current meter installations.

If we compare the use of the shunt in connection with direct current meters, with the current transformer used in connection with the induction meter, we find that the shunt possesses greater disadvantages over the current transformer. The accuracy of the shunted meter is more or less affected by relative temperature changes between meter and shunt or any other relative change of resistance between shunt and meter produced either through change in length of lead or change in contact resistance, etc., whereas

the current transformer together with induction meter are practically not affected by such changes, at the same time the current transformer remains comparatively inexpensive up to the largest capacities, whereas the shunt becomes very expensive in first cost, cost of installation and cost of power lost in its resistance in order to produce the necessary drop.

caused to flow from the secondary d.c. source of power, producing a flux which tends to neutralize the primary flux and this secondary current does not stop rising until the flux in the core has become zero, in which instance the contact of the armature is broken and by a simple process of contacting, the spell of which depends upon the time element of the secondary

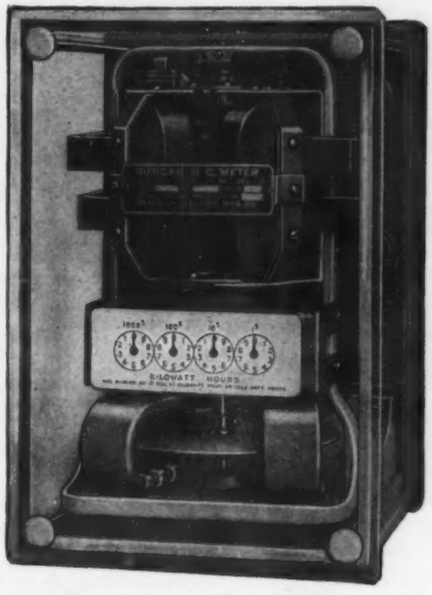


Fig. 4. Shunt Operated Meter With Four Pole Field.

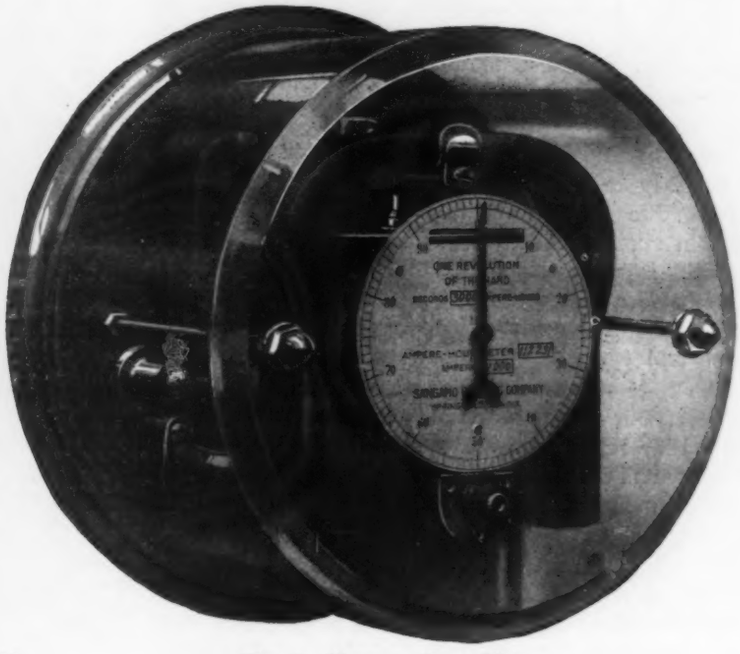


Fig. 5. Mercury Type Meter.

Up to the present time the shunted meter if properly designed and installed is probably the best and least expensive meter for metering large amounts of d.c. power; but not so much from the standpoint of initial accuracy as from that of easily maintaining a fair accuracy.

The trend of further development in direct current metering lies therefore in the development of a piece of apparatus which is the counterpart of the a.c. current transformer.

An automatic ratio relay recently patented by the writer adapts itself admirably to the above mentioned purpose; it may be in some respects called a d.c. current transformer, for practically and theoretically, it performs the function of the well-known a.c. current transformer. It may interest some of the readers to know the theory of its construction.

It is well known that in the a.c. current or series transformers the primary series or line current produces a flux in the iron core which flux, with the secondary of the transformer closed, becomes almost completely neutralized by the secondary current, the lower the resistance and impedance in the secondary circuit, the nearer will be the flux to zero and the more closely will be the ratio of primary to secondary current equal the ratio of turns of the transformer. If we send a direct current through the primary of the d.c. current transformer a flux will be produced in the core of the latter. This core has a small air gap in which a light contacting armature is mounted. This armature is drawn against a contact as the flux begins to rise and in the same instant a secondary current is current producing element, a secondary current is produced which is exactly in ratio of turns equal the primary current.

Such a current ratio relay can be applied just like an a.c. current transformer and has the following advantages:

First. It possesses a uniform ratio throughout its whole range.

Second. The ratio is independent of the secondary load.

Third. The measuring instrument in the secondary can be installed at any distance.

Fourth. The power for operating the measuring instrument is supplied from a secondary source, therefore no drop introduced in the primary circuit and no power consumed out of the primary circuit. (Shunt losses in case of shunt operated meters often amount to several kw. in a single large d.c. meter installation.)

Fifth. The reluctance of the magnetic circuit does not affect the accuracy of the ratio relay, therefore the core can be split and slipped over the conductor without that the ratio can be affected by an imperfect magnetic closure.

Sixth. Without interrupting the circuit measurement can be made of currents flowing in lead covered cables and busbars (distribution currents), pipes and rails (railway return currents), steel girders (electrolysis currents), etc.

Possessing all the above advantages it would seem that the ratio relay is destined to play a more or less important part in the field of direct current measurement.

ELECTRICAL CONTRACTORS' DEPARTMENT

IS UNDERWRITERS' INSPECTION NECESSARY IN OREGON?

BY F. D. WEBER.

[Continued.]

To combat this waste of resources and "conserve our wealth," there was organized in 1895 the National Fire Protection Association. The purpose of the association is to to make standards under guidance of which the fire waste may be checked and to educate the people to the observance of those standards.

Prior to this in 1881, the underwriters' attention was forcibly called to the necessity of electrical inspection, due to the fact that 26 electrical fires occurred in six months in the 65 textile mills of New England. Immediately local rules to handle the situation were formulated, from which grew the National Electrical Code as we have it today, being first adopted as such in 1896.

The code was made by representatives of the various electrical and insurance interests and is amended by a similar representative body. This committee is now known as the Electrical Committee of the N. E. P. A., which meets annually. This is an open meeting and every person and interest is invited to participate.

The "Fire Hazard" of electrical installations and apparatus, has been the fundamental reason for the formulation of Code Rules, but the feeling has now become quite prevalent among all interests represented that "life hazard" should also be considered and we have several rules, in the last edition of the National Electrical Code, which take this into consideration in a definite manner.

It would be useless to have rules for the proper method of installing electrical conductors and apparatus if there were no minimum standard by which to manufacture the various electrical materials and apparatus in order that the fire hazard be eliminated as much as possible. This fact was appreciated very early in the history of the N. E. C., but not until 1894 were any steps taken to found an institution which would approve or criticize materials or apparatus which manufacturers deemed proper for use and desired to sell to the general public. The institution founded is the Underwriters' Laboratories, Inc., 207 E. Ohio street, Chicago, Ill.

The inspections made by the Underwriters' Laboratories, Inc., are based upon standard rules and requirements recommended by the National Fire Protection Association and therefore do not represent arbitrary or personal judgment on the various subjects.

The Laboratories criticize or approve a vast amount of things as shown by the three lists the National Board of Fire Underwriters publish based on their investigation.

List of appliances which are as follows:

(1) List of fire appliances, covering devices, materials and apparatus which may be of service in retarding, extinguishing or indicating fires.

(2) List of electrical fittings, covering devices and materials acceptably safeguarded for use in electric lighting and power equipments.

(3) List of gas, oil, mechanical and chemical appliances, covering hazardous devices, materials and apparatus which are safeguarded in an acceptable manner.

The National Board of Fire Underwriters publishes the following:

List of Rules, Requirements and Specifications.

Acetylene Gas Machines and Storage of Calcium Carbide.
Coal Gas Producers.
*Fire Alarm Systems—Municipal.
Fire Departments—Private—Suggestions for Organizing.
Fire Doors and Shutters.
Fuel Oil, Storage and Use.
Gas and Gasolene Engines, Construction and Installation of.
Gasolene Vapor Gas Lighting Machines, Lamps and Systems.
Gasolene Stoves for Cooking and Heating.
Grain Dryers, Construction and Installation of.
Gravity Tanks, Construction and Installation of.
Hose Couplings and Hydrant Fittings for Public Fire Service, with Details and Dimensions of the National Standard.
**Hose, Private Department, Fire, for Mill Yard Use.
**Hose, Fire Department Use.
Hose Houses for Mill Yards, Construction and Equipment of.
Hose, Unlined Linen, Manufacture of.
Hydrants for Mill Yard Use. (See Valves, Indicator Posts and Hydrants.)
Incubators and Brooders, Construction and Installation of.
Kerosene Oil Pressure Systems, Construction and Installation of, for Lighting and Industrial Uses.
Lightning, Protection Against.
**National Electrical Code.
Nitro-Cellulose Films, Storage and Handling of.
Oxy-Acetylene. Heating and Welding Apparatus.
**Pumps, Centrifugal Fire.
Electric Fire.
Rotary Fire.
Steam Fire.
Governors and Auxiliary Pumps (Steam).
Railway Car Storage and Operating Houses, Construction and Protection of.
**Signaling Systems Used for the Transmission of Signals Affecting the Fire Hazard.
Skylights, Construction and Installation of.
Sprinkler Equipments, Automatic and Open Systems, Installation of.
Storage Systems for 250 Gallons or Less of Fluids which at Ordinary Temperature give off Inflammable Vapors.
Uniform Requirements (Mill Construction, Inferior Construction), General Hazards, Oil Rooms, General Protection, Stair and Elevator Enclosures, Watchmen, Thermostats, etc.
Valves, Indicator Posts and Hydrants for Mill Yard Use.
Waste and Safety Cans, Fire Pails, etc.
Wired Glass and Construction of Frames for Wired and Prism Glass Used as a Fire Retardant, Manufacture, Construction of.

*New Publication. **Revised.

List of Approved Devices.

(Published under one cover—pamphlet known as "List of Manufacturers of Fire Appliances.")

Alarm Valves.
Building Material.
Doors, Corridor or Partition.
Doors, Stair and Elevator.
Doors and Shutters.
Dry Pipe Valves.
Extinguishers, 2½ Gallon, Hand Chemical.
Extinguishers, Miscellaneous
Extinguishers on Wheels, Chemical, 40 Gallons.
Fire Alarms, Automatic (Thermostats).
Fusible Links
Heat Insulating Coverings.
Hardware for Doors and Shutters.
Hose, Cotton Rubber Lined.
Hose, for Chemical Fire Extinguishers.
Hose, Unlined Linen.
Hose Racks.
Hydrants.
Paints, Fire Retardant.
Play Pipe.
Post Cap and Girder Supports.
Pump Governors.
Receptacles (Safety Cans).
Shop Equipment.
Signal and Fire Alarm Systems, Bells for.
Sprinklers, Automatic
Sprinkler Supervisory Devices.
Wall Hangers (Steel).
Waste Cans.
Watchman's Time Recording Apparatus.
Window Frames for Wired Glass.
Window Hardware, Sash Locks, Chains.
Wired Glass.
Wired Glass for use with Burglar Alarm Equipments.

(Published under one cover—pamphlet known as "List of Gas, Oil and Chemical Appliances.")

Acetylene Generators.
Lamps.
Service Tanks.
Cleaning Fluids.
Dust Cloths.
Engines, Fuel Oil.
Gas.
Gasolene, Stationary.
Gasolene, Portable.
Film Box.
Floor Brush.
Fuel Kindler.
Gas Heaters.
Producers, Suction.
Regulators.
Gasolene Gas Machines.
Hose.
Lighting Systems, Class C and Class E.
Oil Distribution Systems, Class C.
Gasolene Stoves.
Vapor Lamps.
Incubators and Brooders.
Kerosene Kiln.
Oil Pressure Systems.
Lime, Slaked.
Liquid Gas Apparatus.
Pitching Plants.
Polish.
Storage Systems, Inside Discharge.
Isolated.
Portable Tanks.
Inside Discharge System Pump.
Stationary Tanks in Buildings.
Underground Tanks.
Sweeping Compounds.
Unions.
Watchmen's Lantern.

Published in book form.

Electrical Fittings.

These lists are revised semi-annually and besides this on the payment of $15.00, a system of card index is furnished any one so desiring it, which is kept up to date by addition of cards mailed each week.

In order that approved apparatus may be known in the field, the label system is used. Labels of distinctive design are attached to the product approved, by which approved articles are easily identified. Other materials are listed under manufacturer's name and catalogue number.

One of the most efficient organizations of the Underwriters in the country, is the National Board of Fire Underwriters, which has been in active operation since 1866. The Board now numbers one hundred and twenty-five members, and its objects as stated in the constitution are as follows:

Purposes.

First: To promote harmony, correct practices, and the principles of sound underwriting; to devise and give effect to measures for the protection of the common interests, and the promotion of such laws and regulations as will secure stability and solidity to capital employed in the business of fire insurance, and protect it against oppressive, unjust and discriminative legislation.

Second: To repress incendiarism and arson by combining in suitable measures for the apprehension, conviction and punishment of criminals guilty of that crime.

Third: To gather such statistics and establish such classification of hazards as may be for the interest of members.

Fourth: To secure the adoption of uniform and correct policy forms and clauses, and to endeavor to agree upon such rules and regulations in reference to the adjustment of losses as may be desirable in the interest of all concerned.

Fifth: To influence the introduction of improved and safe methods of building construction, encourage the adoption of fire protective measures, with adequate and improved water systems, and establish rules designed to regulate all hazards constituting a menace to the business. Every member shall be in honor bound to co-operate with every other member to accomplish the desired objects and purposes of the Board.

At the time of its organization, and for a number of years thereafter, it was the rate-making association of the country, and in a large measure regulated commissions to agents. In 1877 it ceased to regulate rates, and in 1888 it absolved itself from the subject of commissions, and has since been actively concerned in all matters of common interest to the companies and the insuring public. Its membership is composed of union and non-union companies, and its meetings afford opportunity for all classes of companies to meet on common ground and discuss and act upon matters for the best interests of all.

"In a word, the work of the Board is almost entirely of an educational, engineering and public service character and its influence toward uniformity and better practices commands the attention and commendation of both the insurer and the insured. Indeed, few realize the extent of the public service rendered by the National Board of Fire Underwriters, and its efforts to conserve property and lives from the danger of fires; nor is it generally known that the fire insurance companies annually expend, in one way or another, a sum of $3,300,000 in this public service work."

[To be continued.]

THE FERRIS WATER POWER BILL.

(Mr. Ferris introduced the following bill in the House of Representatives, March 21, 1914, when it was referred to the Committee on the Public Lands and ordered to be printed. It is stated to be an administration measure and that its passage is anticipated.—The Editors.)

To provide for the development of water power and the use of public lands in relation thereto, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be, and hereby is, authorized and empowered, under general regulations to be fixed by him, to lease any part of the lands and other property of the United States (including Alaska), reserved or unreserved, including lands in national forests, national monuments, military and other reservations, not including national parks, for a period not longer than fifty years for the purpose of constructing, maintaining, and operating dams, water conduits, reservoirs, power houses, transmission lines, and other works necessary or convenient to the development, generation, transmission and utilization of hydroelectric power, which leases shall be irrevocable except as herein provided, but which may be declared null and void upon breach of any of their terms: Provided, That such leases shall be given within or through any of said national forests, military or other reservation only upon a finding by the chief officer of the department under whose supervision such forest, park, or reservation falls that the lease will not injure, destroy, or be inconsistent with the purpose for which such forest, park, or reservation was created or acquired: Provided further, That in the granting of leases under this act the Secretary of the Interior may, in his discretion, give preference to applications for leases for the development of electrical power for municipal uses and purposes.

Sec. 2. That each lease made in pursuance of this Act shall provide for the reasonable development and continuous operation of the water power, and may provide that the lessee shall at no time, without the consent of the Secretary of the Interior, contract for the delivery to any one consumer of electrical energy in excess of fifty per centum of the total output.

Sec. 3. That in case of the development, generation, transmission and use of power or energy under such a lease in a territory, or in two or more states, the regulation and control of charges for service to consumers is hereby conferred upon the Secretary of the Interior or committed to such body as may be later provided by Federal statute: Provided, That the physical combination of plants or lines for the generation, distribution, and use of power or energy under this Act or under leases given hereunder may be permitted, in the discretion of the Secretary, but combinations, agreements, arrangements, or understandings, express or implied, to limit the output of electrical energy, to restrain trade with foreign nations or between two or more states or within any one state, or to fix, maintain, or increase prices for electrical energy or service is hereby forbidden.

Sec. 4. That no lease issued under this Act shall be assignable or transferable, and no sale or delivery of power to a distributing company shall be made, except upon the written consent of the Secretary of the Interior.

Sec. 5. That after not less than three years' notice the United States shall have the right at any time, from and after fifty years from the date of any lease issued hereunder, to take over the properties which are dependent, in whole or in part, for their usefulness on the continuance of the lease herein provided for, which may be acquired by any lessee acting under the provisions of this act, upon condition that it shall pay, before taking possession, first, the actual cost of rights of way, water rights, lands, and interests

therein purchased and used by the lessee in the generation and distribution of electrical energy under the lease, and, second, the reasonable valuation of all other property taken over, including structures and fixtures acquired, erected, or placed upon the lands and included in the generation or distribution plant, and which are dependent as hereinabove set forth, such reasonable values to be determined by mutual agreement between the Secretary of the Interior and the lessees, and, in case they can not agree, by proceedings instituted in the United States circuit court for that purpose: Provided, That such reasonable valuation shall not include or be affected by the value of the franchise or good will or any other intangible element.

Sec. 6. That in lieu of taking over, maintaining, and operating the properties, as provided in section five hereof, the United States may, at its option, and at the same time and under the same conditions prescribed in said section five, take over and lease the same to another lessee upon such terms, under such conditions, and for such periods as applicable laws may then authorize, upon the condition that the new lessee shall first take over, acquire, and pay for the properties of the first lessee, under the condition and in form and manner provided in section five hereof, or at the option of the United States the lease may be renewed to the original lessee, upon such terms and conditions and for such period as may be authorized under the then existing applicable laws.

Sec. 7. That where, in the judgment of the Secretary of the Interior, the public interest requires or justifies the execution by any lessee of contracts for the sale and delivery of electrical energy for periods extending beyond the life of the lease, such contracts may be entered into upon the approval of the said Secretary, and thereafter, in the event of the exercise of the option of the United States to take over the plant in the manner provided in sections five or six hereof, the United States or its new lessee shall assume and fulfill all such contracts entered into by the first lessee.

Sec. 8. That for the occupancy and use of lands and other property of the United States permitted under this act the Secretary of the Interior is authorized to fix in the lease and collect charges or rentals for all power developed and sold or used by the lessee for any purpose other than the operation of the plant, the proceeds to be used and disposed of, so far as may be necessary, in payment of the cost of administration of this act and of leases or permits thereunder, and the surplus over such cost of administration shall be paid into, reserved and appropriated as a part of the reclamation fund created by the act of congress approved June seventeenth, nineteen hundred and two (Thirty-second Statutes at Large, page three hundred and eighty-eight), and after use thereof in the construction of reclamation works and upon return to the reclamation fund of any such moneys in the manner provided by the reclamation act, fifty per centum of the amounts so utilized in and returned to the reclamation fund shall be paid by the Secretary of the Treasury after the expiration of each fiscal year to the state within the boundaries of which the hydroelectric power or energy is generated and developed, said moneys to be used by such state for the support of public schools or other educational institutions or for the construction of public improvements, as the legislature of the State may direct.

Sec. 9. That the provisions of this act shall apply only to such states as have provided or which may provide a commission or other authority having full power to regulate rates and service of electrical power; and no lease or disposition of lands shall be made under this act in any state wherein such authority has not been provided by law.

Sec. 10. That where the Secretary of the Interior shall determine that the value of any lands, heretofore or hereafter reserved as water power sites or for purposes in connection with water power development or electrical transmission, will not be destroyed for such purposes by either location, entry or disposal, the same may be allowed under applicable land laws upon the express condition that all such locations, entries, or other methods of disposal shall be subject to the sole right of the United States and its authorized lessees or grantees to enter upon, occupy, and use any part or all of such lands reasonably necessary for the accomplishment of all purposes connected with the development, generation, transmission or utilization of power or energy, and all rights acquired in such lands shall be subject to a reservation of such sole right to the United States, its lessees or grantees, which reservation shall be expressed in the patent or other evidence of title: Provided, That locations, entries, selections, or filings heretofore allowed for lands reserved as water power sites or in connection with water power development or electrical transmission may proceed to approval or patent under and subject to the limitation and conditions in this section contained, but nothing herein shall be construed to deny ar abridge rights now granted by law to those seeking to use the public lands for purposes of irrigation or placer mining alone.

Sec. 11. That the Secretary of the Interior is hereby authorized to require lessees to submit statements, representations, or reports, including information as to cost of water rights, lands, easements, and other property acquired, production, use, distribution, and sale of energy, all of which statements, representations or reports so required shall be upon oath, unless otherwise specified, and in such form and upon such blanks as the Secretary of the Interior may require; and any person making any false statement, representation, or report under oath shall be subject to punishment as for perjury.

Sec. 12. That any such lease may be forfeited and canceled, by appropriate proceedings only, in a court of competent jurisdiction whenever the lessee, after reasonable notice, as prescribed in the lease, shall fail to comply with the terms of this act or with such conditions not inconsistent herewith as may be specifically recited in the lease.

Sec. 13. That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this act into full force and effect.

Sec. 14. That all acts and parts of acts inconsistent herewith are hereby repealed.

Reversal of a Railroad Commission order was effected by a decision of the Supreme Court of the State of California, written by Justice Lucien Shaw, during the past week. In April, 1913, the California Railroad Commission refused permission to the Oro Electric Corporation to exercise a franchise privilege granted by the municipality of Stockton, on the grounds that public convenience and necessity did not demand competitive systems in that city. The court now rules that the power granted to the commission by the public utilities act to grant certificates of public convenience and necessity is unconstitutional as applied to municipalities, unless the necessary powers are voluntarily surrendered by the municipalities to the commission. This decision is of great importance in that it curtails the power and jurisdiction of the Railroad Commission, reverses what the commissioners thought to be the law, and gives to municipalities the right to regulate utilities to which they have granted franchises.

SPECIFICATIONS FOR WESTERN CEDAR POLES.

(Readers interested in the proposed Western Red Cedar Pole Specifications published in our March 7, 1914, issue and also referred to editorially in that number, have asked for the publication of specifications still more complete that the discussion may be taken up from all angles. A further specification is given herewith. It is definitely stated that the National Electric Light Association will include the western forest products in official specifications to be published this year.—The Editors.)

The material desired under these specifications consists of poles and guy stubs of the best quality of either seasoned or live green cedar of the dimensions hereinafter specified. The poles covered by these specifications are of Western white cedar, otherwise known as red cedar, Western cedar, or Idaho cedar. Seasoned poles shall have preference over green poles provided they have not been held for seasoning long enough to have developed any of the timber defects hereinafter referred to. All poles shall be reasonably straight, well proportioned from butt to top, shall have both ends squared, sound tops, the bark peeled, and all knots and limbs closely trimmed.

Dimensions.

The dimensions of the poles shall be in accordance with the following table, the "top" measurement being the circumference at the top of the pole, and the "butt" measurement, the circumference six feet from the butt. The dimensions given are the minimum allowable circumferences at the point specified for measurement and are not intended to preclude the acceptance of poles of larger dimensions.

When the dimension at the butt is not given, the poles shall be reasonably well proportioned throughout their entire length. No pole shall be over six inches longer or three inches shorter than the length for which it is accepted. If any pole is more than six inches longer that is required, it shall be cut back.

Minimum Dimensions of Poles in Inches.

Class .....A	B	C	D	E	F
Min. Top Cir..28	25	22	18½	15	12
Length of poles, ft.	Circumference 6 ft. from butt.				
20	30	28	26	24	
22	32	30	27	25	
25	34	31	28	26	
30	37	34	30	28	
35	40	36	32	30	No butt requirement.
40	43	38	34	32	
45	45	40	36	34	
50	47	42	38	36	
55	49	44	40	38	
60	52	46	41	39	
65	54	48	43		

Quality of Timber.

Dead Poles. No dead poles and no poles having dead streaks covering more than one quarter of their surface shall be accepted under these specifications. Poles having dead streaks covering less than one quarter of their surface shall have a circumference greater than otherwise required. The increase in the circumference shall be sufficient to afford a cross sectional area of sound wood equivalent to that of sound poles of the same class.

Twisted, Checked or Cracked Poles. No poles having more than one complete twist for every twenty feet in length, no cracked poles, and no poles containing large season checks, shall be accepted under these specifications.

Crooked Poles. No poles having a short crook or bend, a crook or bend in two planes, or a reverse crook or bend shall be accepted under these specifications. The amount of sweep measured between the six foot mark and the top of the pole, shall not exceed one inch to every six feet in length.

"Cat Faces." No poles having "cat faces" unless they are small and perfectly sound, and the poles have an increased diameter at the "cat face," and no poles having "cat faces" near the six foot mark, or within ten feet of their tops shall be accepted under these specifications.

Shaved Poles. No shaved poles shall be accepted under these specifications.

Wind Shakes. No poles shall have cup shakes (checks in the form of rings) containing heart or star shakes which enclose more than ten per cent of the area of the butt.

Butt Rot. No poles shall have butt rot covering in excess of ten per cent of the total area of the butt. The butt rot, if present, must be located close to the center in order that the pole may be accepted.

Knots. Large knots, if sound and trimmed close shall not be considered a defect. No poles shall contain hollow or rotten knots.

Miscellaneous Defects. No poles containing sap rot, woodpecker's holes or plugged holes, and no poles showing evidences of having been eaten by ants, worms, or grubs, shall be accepted under these specifications.

Marking. Every pole shall be scored with a (insert here company's distinguishing mark) at a point —— feet from the butt.

A government built, owned and operated railroad, the only one in the United States, is the Boise & Arrowrock Railroad, running from the terminus of a branch of the Oregon Short Line to the site of the Arrowrock Dam—the big dam now under construction on Boise River about 20 miles above Boise, Idaho. It is standard gauge, 17 miles in length, with maximum grades of one and one-half per cent, while the additional 2 miles of spur tracks have maximum grades of three per cent. The total cost of construction was about $20,000 per mile. Prior to the construction of the railroad cost of freight hauling by wagon was $8 per ton and the line was built because it was estimated that the saving in cost of freight on the cement alone would nearly pay for the construction cost. The rolling stock consists of two locomotives, two passenger cars, four flat cars, three box cars and a miscellaneous equipment of handcars, speeders and so forth. One round trip from Arrowrock to Barberton is made each week day, and two on Sundays. The cost per train mile of operating the road to the end of December, 1913, as stated in the Reclamation Record from which this article is abstracted, was $2.34, the minimum cost in one month amounting to $1.53 per train mile. The costs compare favorably with the average operating expenses per train mile of the far western roads, which in 1911 amounted to $1.58, while on several of the roads the expenses ran considerably over $3 per train mile. About 45,000 passengers have been carried to date, many of them sightseers who have welcomed the opportunity to make this scenic trip along the picturesque Boise River to the dam site, and to the huge structure being built there.

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POWER AND GAS

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NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advanace of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July, 1895.
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Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1900.
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FOUNDED 1887 AS THE
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Obscuring The Issue

The salesman detected in a mis-statement of fact—one giving utterance only to near-truths which may possibly deceive—is distrusted. He loses the sale. All business must be based upon confidence. Cards held above the table. The game played fair. Otherwise that distrust which is dissolution hinders or halts the purpose planned.

In the southland of California an acute situation exists. A campaign is in progress having for its ultimate object condemnation of certain commercial public utility properties for municipal appropriation and use.

A municipal aqueduct built for the purpose of conveying water for domestic purposes to the city of Los Angeles is found also to be an available source of electric power generation sufficient for the present needs of the city. Whether or no power is developed by the aqueduct its cost as such would have remained constant. It is in the neighborhood of thirty-four million dollars.

Now it is proposed to vote an additional six and one-half million dollars in bonds to complete a power plant and distribution systems in connection with this project, or to acquire by condemnation proceedings the distribution systems of existing commercial utilities.

In their advertisements the advocates of this procedure state that the entire investment made will continue to be a heavy burden unless made to produce electrical energy. "Otherwise the aqueduct will remain idle."

If this gigantic project is not required for the purposes under which the city gained its water rights the question may well be asked "Was that primary purpose a stupendous blunder which it is now desired to cover by the generation of electric power?"

United States government statistics do not in general bear out the statement that "the distribution by the city of its own electricity will result in cheaper electricity in the homes," resulting in "lower electric light bills all over the city."

The excess cost of municipal service is given elsewhere in these editorial columns. The figures show that if commercial electric light and power plants make a profit of five per cent, then with the higher rates charged, those municipally owned should show a profit of more nearly fifty per cent. But the returns show the profits of commercial and municipal plants to be practically equal. This if you ignore the aphorism, that "Municipal plant profits are largely a matter of bookkeeping."

In face of the government statistics recently published it would be difficult to prove that condemnation of the commercial electric light and power plants in Los Angeles constituted a public necessity, but this proof would be required, as the mere necessity for making profit on an investment, rightly or erroneously made, is not sufficient of itself to justify condemnation.

The Journal holds no brief for the power companies in question, but it is only just and fair to them and to the Los Angeles public for us to point out that one of them has the highest load factor of all comparable companies in the United States; a measure of the unequalled service and educational effort put forth by that company in the past.

The management of the Los Angeles municipal plant would have to guarantee to "beat the best" in order to substantiate condemnation proceedings.

And as an incidental question it would be interesting to learn just how the city of Los Angeles purposes to reduce lighting rates to its citizens cumbered as it is with this burdensome and growing investment of forty million dollars which is to represent a development of only thirty-five thousand kilowatts.

All of which forcibly questions the accuracy of all the statements made as well as sincerity of those who say that the aqueduct investment is, in its entirety, chargeable to the electric light and power plant.

Business Hampering Bills

How long? The question is not new but is none the less insistent. "How long halt ye between two opinions?" Whether it be better to so hobble business enterprise that it cannot board the business buggy, or, on the other hand to give such freedom to business that the first step upward will be made possible and the car of commerce move onward with its freight of prosperity for the country at large? At least declare.

Fifty years ago, to hark back merely one period, Henry Ward Beecher speaking on the slave question and appealing to the Anglo-Saxon business instinct, said: "The things required for prosperous labor, prosperous manufacture and prosperous commerce are three: first, liberty; secondly, liberty; and thirdly, liberty.

"First, there must be liberty to follow those laws of business which experience has developed, without imposts or restrictions, or governmental intrusions. Business simply wants to be let alone."

And business today, as of old-time, simply wants to be let alone.

Legislation should encourage business and not hamper.

This comment is called forth by the introduction of yet another water power bill in the House of Representatives. It is stated to be an administration measure and its passage is therefore anticipated. To the West the measure is not desirable.

There seems to be no end to the making of unnecessary business hampering bills. Something always seems lacking, and their study is a weariness of the flesh.

This particular bill is said to have been "fathered" in Oklahoma and Missouri, where water power development is a curiosity and where municipal ownership of lighting plants, there at a maximum, results in an average revenue of approximately four cents per kilowatt hour as against less than half that amount under water power development by commercially operated plants in the West.

Why not the introduction of a water power code by a western member voicing a policy not inimical to business interests, not only of the West, but elsewhere?

A code which shall merely emphasize the state's control of these matters, with federal international exceptions; which eliminates dual authority; which by definite contracts encourages investment; limits the office of public officials to that of custody instead of rule; vests control of the business of the plants in the state; and, in view of the fact that the investor is not looking for abnormal profits from development enterprises but for a continuity of business, that this be made possible and that absolute protection be afforded the investor, especially in view of the allowance only of a reasonable, which is interpreted, "limited" rate of return.

There is an opportunity for someone to proffer such a program and in the interests of a comparative industrial liberty, to prosecute its adoption.

Municipal Plants' Power Rates

Municipal ownership of public utilities is favored because of certain advantages which will accrue to the people; the most important always being that which appeals to the pocket namely, a reduction in rates. The value of such a "reduction" should first be noted for if statistics show that this is actually brought about the worth of the reduction is an important factor in deciding the desirability of municipal ownership.

The expenditure of the average citizen for utility service approximates ten per cent of his income, about two per cent being spent for light.

The city lighting plant, the latest bauble of the public craze, might therefore be made to save this average citizen the expenditure of one per cent of his income by reducing his lighting bill fifty per cent.

But statistics issued by the Bureau of the Census, and recently made public, point to the fact that the municipal electric light plant is non-successful in effecting reductions.

The average revenue per kilowatt hour output of municipal plants shows an increase during the past ten years of 21 per cent. During the same period that of the commercial plants decreased 28 per cent; this revenue per kilowatt hour of municipal plants being 80 per cent higher than that of the commercial plants in 1912.

On this basis municipal ownership would have cost the people of the United States on their requirements for 1912, over two hundred million dollars more than it did. The apparent excess cost, however, was ten million dollars, as the municipal plants, though nearly 30 per cent of the total, represent less than five per cent of the output of all stations.

There may be an excess of less profitable municipal business. But why? Does not this emphasize the further fact, dealt with more fully in a recent editorial, that any small saving to each consumer which might possibly result from municipal ownership is more than off-set by arrested development and lack of enterprise in other directions. These cause even greater losses.

The figures given are not final, or applicable to any locality any more than is the statement that municipal ownership because successful in one place must necessarily be successful in another.

They do however, reasonably suppose the existence of concrete arguments which should be advanced against municipal ownership in general and urge the introduction of cogent analysis to take the place of superficial statements, based upon the possibilities or impracticableness of municipal ownership in the United States because of its success or failure abroad.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

James T. Lea has joined the sales force of the Great Western Power Company at Oakland, Cal.

Wm. Henning, superintendent Desert Power & Water Company, Kingman, Arizona, is at San Francisco.

Leroy C. Bishop has been appointed general manager of the Berkeley Electric Cooker Company, Berkeley, Cal.

C. A. Hunt, manager of the Hunt Electric Company of Santa Cruz, Cal., was at San Francisco during the past week.

H. D. Brainard, sales manager of the Western Electric Company at Seattle, is making a tour of Washington and Oregon.

J. A. Nadon of the Westinghouse Electric & Manufacturing Company, San Francisco, was at Reno, Nev., during the past week.

M. G. Carhart, power apparatus specialist for the Western Electric Company at Seattle, is spending a week in Oregon territory.

Walter S. Van Winkle, power salesman with the Great Western Power Company, joined the ranks of the benedicts at Berkeley on April 15th.

Bertram Smith, assistant manager Edison Storage Battery Supply Company, San Francisco, has left for a trip to Los Angeles and San Diego.

F. G. Baum, consulting engineer Pacific Gas & Electric Company, San Francisco has been transferred to the grade of Fellow of the American Institute of Electrical Engineers.

L. Bartlett distribution engineer with Henry L. Doherty Operating Company, New York City, is visiting the Pacific Coast looking over local properties and spent last week in San Francisco.

Mort H. Dodge, district manager of the Standard Electric Time Company, with headquarters at Seattle, Washington, is at Salt Lake City supervising the installation of time service clocks for his company.

H. L. Vorse, assistant electric inspector of the Underwriters' Equitable Rating Bureau, Portland, Oregon, has been in poor health for the past three months, but is now recuperating on a ranch near Prineville, Oregon.

Victor E. Thurman, formerly with the Richfield (Utah) Light & Power Company, is developing an invention of his consisting of an electric illuminating sign to be attached to an incandescent or arc lamp post on business streets for advertising purposes.

Clarence G. Pyle, district sales agent, Standard Underground Cable Company, Los Angeles; **Julian Adams,** assistant electrical superintendent, Pacific Electric Railway Company, Los Angeles, and **M. G. Adler,** chief draftsman, Los Angeles Aqueduct Power, Los Angeles, Cal., have been transferred to the grade of Member A. I. E. E.

J. L. White, for several years manager of the Dallas division of the Oregon Power Company, has been transferred to Albany, Oregon, as manager of the company's interests there, succeeding **H. E. Morton,** resigned. **A. L. Martin,** formerly manager of the company's property at Corvallis will succeed Mr. White at Dallas, and **R. U. Steelquist** has been appointed manager in Mr. White's place at Corvallis.

Ralph B. Clapp has opened offices at 600 Fernando Building, Los Angeles, Cal., as manufacturers' agent and announces having secured, among others, agencies for the Hubbell line and for American Circular Loom in Southern California. This announcement will serve to correct a wrong impression created by part of our notice of last week regarding Mr. Clapp's association with F. Foster & Company, Los Angeles.

Geo. A. Hughes, president of the Hughes Electric Heating Company, accompanied by **W. L. Overman,** their western representative, were in Salt Lake City last week opening up the electric range business for their company, the Western Electric Company having arranged to carry a stock of their stoves. Mr. Hughes is enthusiastic over the prospects for electric heating particularly in western states, where so many electric companies have established special heating and cooking rates, which places the cost of cooking with electricity on a par with gas.

Stephen L. Coles has resigned the secretary-treasurership of The Society for Electrical Development, effective April 15. As of the same date he has joined the engineering staff of M. W. Thompson, 111 Broadway, New York City, specialist in litigated engineering matters and in reports on railroad and other large properties. Mr. Coles will devote his attention principally to electrical public utilities having problems of service, policy and competition to solve. He has grown up with the electrical industry, his first work having been with the old New England Wiring & Construction Company, of Boston, in installing an isolated electric lighting plant at Springfield, Mass., in 1889, for the Boston & Albany Railroad. Since August 1 last Mr. Coles has been acting secretary-treasurer and secretary-treasurer of The Society for Electrical Development and has concentrated his energies on doing his share toward making the Society an accomplished fact and an actual reality.

Leslie W. Allen, sales engineer, Westinghouse Electric and Manufacturing Company, Spokane, Wash., has been elected an associate member of the American Institute of Electrical Engineers. Other western engineers recently elected associates are: **G. B. Burnham,** sales agent General Electric Company, San Francisco; **E. C. Carr,** University of Washington, Seattle, Wash.; **Fred W. Dietrich,** assistant engineer, Eugene Water Board, Eugene, Ore.; **Walter H. Dyer,** instructor of electrical engineering, Billings Polytechnic Institute, Billings, Mont.; **G. E. Garthorne,** Pacific Gas & Electric Company, San Francisco; **James Oliver Jensen,** secretary and general manager Los Gatos Telephone Company, Los Gatos, Cal.; **Fletcher A. Jeter,** superintendent substations, Spokane Inland Empire Railway Company, Spokane, Wash.; **Paul P. Kaylor,** chief electrician Olympic Portland Cement Company, Bellingham, Wash.; **Chas. D. Kunkel,** sales engineer Westinghouse Electric & Manufacturing Company, Spokane, Wash.; **James N. Lightbody,** electrical draftsman, City Electric Light Department, Calgary, Alta.; **G. M. Simonson,** electrical draftsman, State Department of Engineering, Sacramento, Cal.; and **Morris Wenk.** draftsman, Stockton Iron Works, Stockton, Cal.

MEETING NOTICES.

Oregon Electrical Contractors' Association.

A regular business meeting of the O. E. C. A. was held Wednesday evening April 8th, at the Portland Commercial Club. In a short time the association expects to have the program for the coming convention prepared.

Seattle Jovian League.

The Seattle Jovians held their weekly meeting at the Hotel Lincoln Friday, April 10th. The after-dinner speaker was P. D. Naugle, engineer for the Kilbourne & Clark Company of Seattle, who spoke for about half an hour on the interesting subject of wireless telegraphy.

Portland Chapter, A. I. C. E.

Saturday evening, April 4th, the Portland Chapter of A. I. C. E. held their regular meeting in Portland, Oregon, when J. P. Newell presented a paper on "Depreciation as Applied in the Valuation of Public Utilities." Mr. Newell is one of the engineers connected with the railroad commission of Oregon. His interesting paper is to be published in the proceedings of the American Institute of Civil Engineers.

Utah Electric Club.

At the regular weekly luncheon of the Utah Electric Club held at the Commercial Club Thursday, April 9th, H. F. Holland, G. H. Williams and C. B. Hawley were appointed a joint committee of the Utah Electric Club to draft resolutions on the death of Vincent F. Connolly, who died suddenly at Idaho Falls on the 27th of March. Dr. C. A. Wherry, the regular speaker of the day, talked on the subject of "Radium and its Medical Application."

Portland Sections A. I. E. E. and N. E. L. A.

A joint meeting was held at 8 p. m. Tuesday, April 7th, at the Assembly Hall, Hawthorne Building, Portland, Oregon. An illustrated lecture "The Panama Canal and Its Electrification," prepared by D. B. Rushmore, was presented by E. A. West, efficiency engineer, Portland Railway, Light & Power Company. An interesting paper, now being published in this journal and entitled "Is Underwriters' Inspection Necessary in Oregon?" was presented by F. D. Weber, Inspector Underwriters' Equitable Rating Bureau.

Southern California Jovian Electrical League.

Frederick P. Vose, the well known Chicago attorney and secretary of the National Credit Men's Association, delivered a very instructive and gingery address before the League Wednesday, April 8th, on the subject of "Electrical Credits." What Mr. Vose does not know about the credit game is hardly worth knowing and a lot of valuable information was absorbed by all present. He deplored the lack of harmony and co-operation between the credit and sales department of the average business house, which he thought deserved very serious consideration. He classed Capital, Capacity and Character as the three most important things to be considered in extending credit, with Character as the most important of the three. Roland Paul sang and J. E. McDonald acted as chairman. The meeting being held at Christopher's, Los Angeles. A pool tournament in which the majority of the members will participate, will begin Wednesday, April 8th, and a theatre party is arranged for April 16th. A local employment bureau has been established for the benefit of the members.

Portland (Ore.) Ad Club.

In an atmosphere that was filled with the uncanny crackling and flashing of electricity, Lucifer himself appeared at the luncheon of the Portland Ad Club held at the Portland Hotel on April 8th, and thrilled the members with various startling feats, as he played with the tricky element. Preparations for the entertainment were elaborate. The installation of the lights and apparatus was by men from the Portland Railway, Light & Power Company, the Northwestern Electric, General Electric, Pacific States Electric companies and Contractors' Electrical Association. When the luncheon commenced a wireless machine crackled out an aerogram of greeting purporting to come from Thomas A. Edison.

When the announcement of the speaker of the day came, a quarrel was "faked" between President Berg and Vice-President Baker over the appointment of the day's chairman. Following a selection by the band of the Electrical Contractors, Mr. McMicken gave a talk on the development of the electrical industry. Then the lights flashed off, half a dozen electrical machines began sparking and sputtering and in the uproar L. T. Merwin, in the garb of Lucifer walked in and took charge of things. He was assisted by Philip Alger, disguised as a negro. They fried eggs by electricity on the cold top of a table, they welded iron bars in a basin of cold water, and performed half a dozen other startling feats. Then the negro was struck down by a fake contact and the pulmotor was rushed in.

At the later part of the program the "famous French savant, Henri Jacques Boissant," demonstrated his wonderful invention of the talking arc light. The arc light, tuned to respond to the vibrations of the human voice, delivered an address in French from where it hung above the heads of the Admen, while C. Henri Labbe translated for them. It transpired that Mr. Boissant was Folger Johnson and that the "talking arc light" was an electrical phenomenon, developed by men in the shops of the Northwestern Electric Company.

Thomas Drier, editor of Associated Advertising, talked on the demands of modern advertising.

San Francisco Jovians.

The San Francisco Jovians held their regular monthly meeting Tuesday of this week during the lunch hour, at a down-town cafe. The gathering was one of the largest and most enthusiastic held for some time, some sixty or more members sitting down to luncheon.

Having in mind the recent bereavement of Jovian H. B. Squires, the following resolution was read by A. H. Halloran, and adopted by the meeting:

"In view of the recent bereavement of H. B. Squires, and because of the high esteem in which his wife and helpmate was held by all who came in contact with her beautiful character and uplifting influence, and seeing that the world was better and brighter, life's struggle more hopeful, from her brief stay on earth,

"Be it Resolved, That the Jovian Order, through its local organization, tender its heartfelt sympathy and sincere condolence to our brother Jovian, and hereby express its deep sense of loss in the passing of this noble woman, whose high ideals, happy disposition and unselfish devotion should prove an example and inspiration to all;

"Be it further Resolved, That copies of this resolution be transmitted to the family and to the National headquarters and that a copy be preserved in the local archives of the Order."

A floral piece was ordered sent and a copy of the foregoing resolution was forwarded to Jovian Squires.

Report of the nominating committee, appointed at the previous meeting to select candidates for the degree team, and adopted as a whole, was as follows:

C. C. Hillis, Jupiter.	Jas. W. Redpath, Mercury.
M. S. Orrick, Neptune.	C. F. Butte, Apollo.
F. D. Fagan, Pluto.	W. S. Hanbridge, Hercules.
A. V. Thompson, Vulcan.	W. S. Dunbar, Avrenim.
A. H. Elliott, Mars.	P. B. Hyde, Triton.

Imps—H. A. Sayles, J. A. Herr, A. V. Olson, H. S. Wolfe, A. Kempston, W. L. Neelands.

Statesman Rowe announced that a rejuvenation would be held on Friday night, May 15, and appointed the following committees to start a campaign for members in each of the branches of the industry represented:

Manufacturers.	Jobbers.	Contractors.
P. B. Hyde.	A. Meinema.	W. S. Handbridge.
Thomas Collins.	M. Orrick.	C. F. Butte.
H. G. Aylesworth.	G. Curtis.	L. Levy.
Frank Fagan.	B. Y. Gibson.	N. M. Hope.
Central Stations.	**Street Railway.**	**Telephone.**
W. J. Neiman.	H. R. Noack.	W. S. Berry.
J. E. Van Housear.	A. V. Thompson.	John Gilkyson.
L. M. Hardie.	Carl Hiese.	H. C. Goldrick.
R. E. Fisher.	W. W. Briggs.	Garnett Young.

Prizes are to be awarded to those getting the greatest number of candidates, and considerable emulation will be developed in determining which branch will make the best showing.

An entertainment committee was also appointed, consisting of S. L. Hawkins, Arthur Brown, F. W. Wilson and D. G. Gallivan.

GAME WILL BE PLAYED.

The postponed ball game, Peddlers v. Pawnbrokers, will be played at San Francisco on the Ocean Shore Grounds, Saturday, April 18th, at 2:30 p.m. sharp. The date previously adveritised was in error.

CALIFORNIA ASSOCIATION OF ELECTRICAL INSPECTORS

Section of N. A. E. I.

C. W. Mitchell, President. Arthur Kempston.
Wm. G. Pennycook, Vice-Pres. B. C. Hill, Executive Comm.
John W. Carrell Secretary-Treasurer, 55 Fulton, San Francisco.

The purpose of this organization is to standardize the common practice in electrical construction with the National Code as the general standard.

Questions pertaining to electrical construction will be answered in these columns, but only from the point of view of the Code. This is a voluntary organization and the answers published under this heading must not be construed as authoritative, or binding. No attempt will be made to correllate the answer from the several Inspection Districts, as an occasional difference of opinion will tend to induce further study on subjects. All questions will be passed upon by an executive committee.

Address all communications to the secretary.

By the Secretary.

Majorities cannot make anything right but they sometimes decide questions. Men engaged in study along technical lines usually bow to the most highly developed opinion (if clearly set forth) even though it appear at first as a minority opinion.

Contractors, always engaged to some degree in keen competition, subject rules and opinions governing construction to severe egotistical calculation, because, among other things, they must make their business pay. Minimum requirements are usually maximum requirements for them. More than this they demand immediate decisions on questions which arise on the work and look at the decisions from the view-point of cost. For these reasons many arbitrarily assumed rules are established which vary according to the source of interpretation.

To promote uniform enforcement of the rules which comprise the National Code is the object of this association. Those who would aid in this work should send us questions on electrical construction met with in practice.

Ques. 1. Twenty-three motors operate tools in a machine and pattern shop and are supplied through cut-out cabinets as follows:

Cabinet No. 1—		Cabinet No. 2—	
72 in. planer	30 h.p.	8 ft. radial drill	10 h.p.
48 in. planer	20 h.p.	3 ft. radial drill	4 h.p.
60 in. lathe	20 h.p.	60 ft. Boring Mill	15 h.p.
30 in. lathe	10 h.p.	Slotter	10 h.p.
18 in. lathe	6 h.p.	Slotter	3 h..p
Grinder	3 h.p.	Drill press	5 h.p.
Cabinet No. 3—		Cabinet No. 4—	
Electric Crane:		Edger	5 h.p.
Hoist	20 h.p.	Rip saw	5 h.p.
Bridge	10 h.p.	Band saw	7.5 h.p.
Trolley	3 h.p.	Joiner	5 h.p.
Hydraulic press	3 h.p.	Sander	1 h.p.
Bolt cutter	5 h.p.	Wood planer	8 h.p.

(Note: Rubber covered wire.)

Direct current is transmitted over a 2-wire service to a power panel and thence over separate feeders to the respective cabinets. What size wires are required for the service? For the feeders? What Code rules govern size of same?

Ans. 1. The aggregate current ratings of the motors plus 25 per cent of current rating of the largest motor in each of the respective cases would, of course, be the maximum current. Conductors having a safe carrying capacity equal to the maximum current would be accepted without question. The rules governing feed wires and sub feed wires is 23 (e). In my opinion Rule 8 (b) applies only to the actual leads or branch circuit to which the individual motor is connected and not to the feed.

The writer knows of an installation of small motors totaling about 150 h.p. For these a service of 2-700,000 c.m. was run, the motors operating at 250 volts. The service company placed two 300 amp. fuses ahead of the meter through which all current passed. I changed these fuses to satisfy myself that they were not reinforced with the time honored copper wire. To my knowledge the 300 amp. fuses held up for more than a year

For groups 1, 2 and 4 I should say that the feed wires have safe carrying capacity equal to 50 per cent of total current ratings of respective groups. For group No. 3, full capacity. For service, 35 per cent of total current ratings for all motors.

Ans. 2. Rule 8 (b). Full capacity and twenty-five percentum of largest motor current.

Ans. 3. Replying to question No. 1, if you will refer to the Code Rule—Section 8 b—in the latter part of that section you will see that it is taken care of. In this case I would allow the main feeds and sub-feeds to be used large enough to take care of the maximum load without 25 per cent overload.

Ans. 4. Code Rule No. 8 (b) requires motor leads and branch circuits to be large enough to carry a current 25 per cent greater than that for which the motor is rated. Where several motors are on one set of feeders, as in this case, it is customary to make these feeders large enough to carry the full load current of all the motors plus 25 per cent of the full load current of the largest motor in the group. According to this rule the sizes of rubber covered wires required in this case would be as follows:

Cabinet No. 1—500,000 c.m.; No. 2—0000 B. & S. G.; No. 3—000 B. & S. G; and No. 4—00 B. & S. G. Service—1,400,000 c. m.

Note—Voltage not given in question. Taken to be 220 volts.

Ans. 5. Answering question one, you do not state what voltage is used, or the distance from the source of supply to the switchboard, or the distance from the switchboard to the different cut out boxes. Therefore I am assuming that the service is 200 ft. distant, that box No. 1 is 80 ft. from the switchboard; No. 2 is 75 ft.; No. 3 is 100 ft., and No. 4 is 85 ft., respectively. Also that the voltage is 500 and that the motors from 7.5 to 30 h. p. have an efficiency of 90 per cent, the 6 h.p. at 85; the 3, 4 and 5 h.p., 80, and the one h.p., 75 per cent. Further, that the drop in line voltage is two volts. Again the code rules, Section 8b, paragraph 3, provides that the branch circuits must be 25 per cent larger than the rated capacity of the motors.

This would make the size of wire necessary for service 500,000 circular mils. Circuit to cabinet No. 1 will require a conductor of 000; circuit to cabinet No. 2 will require a conductor of No. 1; circuit to cabinet No. 3 will require a conductor of No. 1; and circuit to cabinet No. 4 will require a conductor of No. 3.

Code rules, 8b, paragraph 3, and Section 18, govern the size of wires to be used.

Ans. 6. Problem No. 1—(1) Service for 125 volts would be 2-900,000 c. m., equivalent for each leg; (2) Feeders, cabinet No. 1, 800,000 c.m.; No. 2, 300,000 c.m.; No. 3, 300,000 c.m.; No. 4, 0000 c.m.

Ans. 7. There is no National Code Rule which fully covers the size of feeds for more than one d.c. motor on one set of feeds. The first three lines in the third paragraph of Rule 8 (b) Code comes the nearest to governing same. A d.c. motor starts through a rheostat made for the same size motor it controls and taking it for granted that each motor circuit to each individual motor from of the four cabinets complies with the third paragraph of Rule 8 (b) and that the circuits are each protected by their proper fuses and that the motors are the proper size motors for the machines they drive. I would consider that in figuring the size of feeds to each cabinet that if you allowed 25 per cent overload for the largest motor fed out of each cabinet and figure the other motors at their capacity and for the service if you allowed 25 per cent overload for the largest motor in the system (which is a 30 h.p motor) and all the other motors of the system at their capacity, I think you would have sufficient copper to comply with Rule 8 (b). The classification of service part of this rule does not apply to d.c. motors in my opinion. Taking this for granted, a 220 volt d.c. system and

figuring roughly, allowing 3½ amp. per h.p. and not considering the efficiency of the different motors which vary according to size, I would say the size of feeds were as follows: Cabinet No. 1, 335 amp., 2-500,000 c.m.; Cabinet No. 2, 185 amp., 2-0000 c.m.; Cabinet No. 3, 230 amp., 2-300,000 c.m.; Cabinet No. 4, 115 amp., 2-No. 0; and service, 900 amp., 2-1,700,000 c.m.

Ques. 2. A main service cut-out, enclosed in a metal cabinet, is installed in an unfinished attic at the point where the service enters the building. The attic is 8 ft. in height at the point mentioned and of easy approach by means of a stairway. Is this permissible?

Ans. 1. Yes.

Ans. 2. Yes, if an approved cabinet is used.

Ans. 3. Yes, refer to Section 23 (a).

Ans. 4. Yes, if the cabinet is an approved type. (Not in San Francisco, however, under the provisions of ordinance No. 2582.)

Ans. 6. I believe that the code permits the use of cabinet placed in an unfinished attic inasmuch as it does not mention this, but I believe that local conditions would govern this kind of installation for in some cities the meter must be in a certain place on the outside of a building; in this instance the service would have to be run through to the ground again, then up to the top floors. I would not allow this only in special cases.

Ans. 5. No. Not accessible according to code.

Ans. 7. I would say yes on this particular building (Rule 23a). But on most buildings in this city it would be impractical and cut-outs would not be readily accessible on account of not having attics of that size and most of them none at all.

Ques. 3. How far should a cross-over tube extend on each side of a passing conductor?

Ans. 1. Far enough to give the required distance between wires for the parts of the wires not covered by the tube.

Ans. 2. I should say two inches.

Ans. 3. A cross over tube should not be less than three inches and the wire crossing same should be in the center of tube and fastened to the tube with tape and painted.

Ans. 4. Bushing should extend two inches on each side of wire as covered by Section 16 (e).

Ans. 5. Rule 26 (R) while not directly applicable will require tubes to extend one inch beyond the passing conductor.

Ans. 6. I would say a three inch tube or an inch and a half on each side of a passing conductor if tube is securely fastened to the wire at both ends. Rule 16 (e) does not state length of tube.

Ans. 7. Must be kept two inches from passing conductor or enclosed so as to maintain a two inch separation. See Rule 16 (e).

UNITED STATES CIVIL SERVICE EXAMINATION FOR ELECTRICIAN.

The United States Civil Service Commission announces an open competitive examination for electrician, on May 6, 1914. From the register of eligibles resulting from this examination certification will be made to fill vacancies as they may occur in this position in the Departmental Service at Washington, D. C., and other services, unless it is found to be in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion. The usual entrance salary for electricians is about $4 per diem.

Competitors will be examined in:

	Subject.	Relative Weight.
1.	Report writing (test in writing in letter form a report not more than 200 words in length, summarizing and arranging in logical order a series of facts included in a given statement of 400 or 500 words)	10
2.	Practical questions	65
3.	Training and experience	25
	Total	100

Experience in the care, maintenance, repair and operation of station storage batteries and lead burning is very desirable in this examination, and persons with such qualifications should state fully their experience in the application. Age, 20 years or over on the date of the examination. This examination is open to all men who are citizens of the United States and who meet the requirements. Persons who meet the requirements and desire this examination should at once apply for application Form 304 to the United States Civil Service Commission, Washington, D. C., or to the secretary of the United States Civil Service Board at any of the principal cities of the United States.

UNITED STATES CIVIL SERVICE EXAMINATION FOR ELECTRICAL MACHINIST.

The United States Civil Service Commission announces an open competitive examination for electrical machinist. From the register of eligibles resulting from this examination certification will be made to fill one vacancy in this position in the Signal Service at Large, Fort Wood, New York, and one in the same service at Fort Mason, California, each at $1000 per annum, and vacancies as they may occur in positions requiring similar qualifications, unless it is found to be in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

Competitors will not be assembled for examination, but will be rated on the following subjects:

	Subjects.	Relative Weight.
1.	Physical ability	40
2.	Training and experience	60
	Total	100

Applicants for this position should be practical electrical machinists with three years' or more experience and it is absolutely essential for an applicant to have the following qualifications:

(a) He must be an electrical machinist or instrument maker.

(b) He must have a common knowledge of electricity as to circuits, insulation, conductivity, and contacts, in order that he may be able to handle electrical apparatus and instruments in an intelligent manner.

(c) He must be competent to repair telephones, telegraph instruments, switchboards, radio apparatus, etc., which includes the making of parts of such instruments, and repairing and making tools. Age, 20 years or over on the date of the examination.

This examination is open to all men who are citizens of the United States and who meet the requirements. They should at once apply for application Form 1800 to the United States Civil Service Commission, Washington, D. C.; the secretary of the United States Civil Service Board, Post Office, Seattle, Wash.; or San Francisco, Cal. No application will be accepted unless properly executed, including the medical certificate, and filed with the commission at Washington prior to the hour of closing business on April 27, 1914.

INDUSTRIAL GAS CALORIMETRY.

Those of our readers interested in the measurement of the heating values of gases will be pleased to hear of a forthcoming publication, from the Bureau of Standards, of a paper entitled Industrial Gas Calorimetry, dealing with this question in great detail. The accurate measurement of the heating value of gases is a question of great importance at this time to all interested in gas, whether from the manufacturing, inspecting, or regulating aspects, so that an authoritative publication dealing with this important question will no doubt prove of interest and value to many American engineers and technical men. Reprints of this paper, which contains over 125 pages and 70 tables and illustrations, may be obtained from the Bureau of Standards, Washington, D. C., on written request. It will come from press about June 1st.

INDUSTRIAL

A "SAFETY FIRST" WASHING MACHINE.

The illustration herewith gives a good idea of the main features of one of the popular electric washing machines now on the market. To those familiar with machines of this character, the main features of the Eden will especially appeal. It will be noticed that all gearing and moving parts are covered, avoiding all chance of injury to the person of

Dissembled View of "Eden" Washer.

the operator or to children, even the shaft from the motor being covered. All of the gearing or parts requiring lubrication run in a tight box filled with hard grease, thus doing away with the necessity of oiling, and insuring cleanliness. The body and frame of the machine is heavily enameled in gray. It has other novel features. These machines will be handled by the Electric Appliance Company, 807 Mission street, San Francisco.

ELECTRIC CURLING IRON.

A new electric curling iron is being manufactured and sold by the Westinghouse Electric & Manufacturing Company. This curling iron can be used with stored heat, as with the flame-heated curling iron. In addition, it can be used with continuous heat, a use which cannot be obtained with the flame-heated iron.

For use with stored heat, the iron is first heated by connecting it to the electric circuit. When it is hot, the swivel plug is pulled out, disconnecting the cord and electric circuit. It is then like the flame-heated curling iron and is used in the same manner. When it gets cold, the plug is pushed into place until it is hot again.

When it is used with continuous heat, the swivel plug enables the user to grasp the iron in such a way that it can be freely rotated by the thumb and fingers without twisting the cord.

It can be used with or without the hair clamp, which is easily removable.

This iron is the result of long study and experimentation, a curling iron that is simple, reliable and very rugged in construction. The heating element is in the form of a rod inserted directly in the barrel. It can be removed by loosening two screws in the handle. If from misuse, the heating element burns out it can be replaced with less than five minutes work. The heating element terminals are positive in action, there being no possibility of loose contacts. The swivel plug, which fits in the end of the handle, is formed of especially prepared moulded composition and will not break if dropped. In this plug are carried strong spring contacts which make connection with the terminals of the heater. The cord is attached to these contacts within the swivel plug. There are no exposed terminals and hence no live parts.

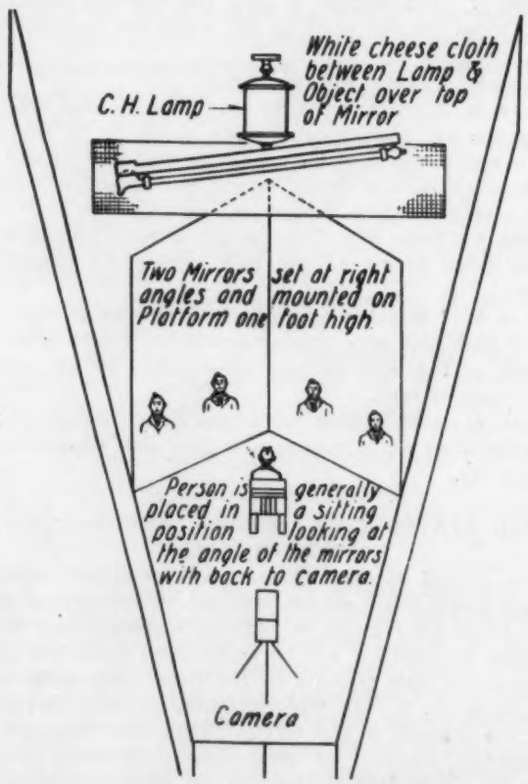
As the input is only 15 watts, it costs only about one-tenth of a cent an hour to use this curling iron with the average price for current.

All metal parts are nickel plated and highly polished. The handle is of wood, black ebony finished and highly polished.

MULTIPLE PHOTOGRAPHS.

The scheme of showing in a photograph four or five likenesses of one individual has always proved an attractive one because of a certain air of mystery surrounding it. To the average person it is quite mystifying how the different poses can be secured of the same individual all on one plate. The attached sketch shows how this may be effected.

There are two special mirrors with frames only on three sides each five feet high and three feet wide placed at angles of about 75 degrees to each other, the angle being formed


White cheese cloth between Lamp & Object over top of Mirror
C.H. Lamp
Two Mirrors set at right angles and mounted on Platform one foot high
Person is generally placed in a sitting position looking at the angle of the mirrors with back to camera.
Camera

Arrangement of Equipment for Multiple Photography.

by the edges of the glass alone. The subject sits at a table with his back to the camera, facing the angle formed by the mirrors. The camera then points at the back of his head, and the reproduction obtained from the combination of the mirrors results in showing on the plate a reproduction which

looks as if five men were sitting at the table, each an exact duplicate of the other.

Frequently, the subject is photographed playing cards, and this results in a view of five men, exactly the same in appearance, playing a game of cards with each other.

Not the least important feature of this scheme is that of securing the right light with the proper diffusion. In this case, the well known Cooper Hewitt lamp is suspended directly over the man's head, and about half way between the location of the man and the mirrors. White cheese cloth is placed between the lamp and the object over the top of the mirrors in order to further increase the diffusion.

The accompanying illustration shows how the scheme may be worked out.

TRADE NOTES.

A. J. Pahl, K. P. F. Electric Company, San Francisco, has the contract for laying the new submarine cable under San Francisco Bay for the Great Western Power Company.

The American Ever-Ready Company, New York City, manufacturers of batteries, electric flash lamps, etc., is now to be known as American Every Ready Works of National Carbon Company.

Wagner Electric Manufacturing Company of Saint Louis, announce the opening of a branch office in Suite 524, Syracuse University Block, Syracuse, New York, in charge of J. W. Bryant, resident agent.

The Union Iron Works, which recently moved into its new headquarters and works at Fifty-second street and Santa Fe avenue, Los Angeles, Cal., is making arrangements through Wm. van den Heuvel, consulting engineer, for the purchase of the necessary apparatus for the furnishing of direct current energy for part of its new shop equipment.

The Cutler-Hammer Manufacturing Company has recently taken over the Vulcan Motor Devices Company, of Philadelphia, makers of the Vulcan Electric Gear Shift. This gear shift will be manufactured and marketed exclusively by The Cutler-Hammer Manufacturing Company at the Milwaukee plant under the Vulcan patents.

The Shaw Mining & Milling Company intend building a 2200 volt transmission line 1½ miles in length from the Western States Gas & Electric Company's line 1½ miles to their mine near El Dorado, California. H. de C. Richards, Crocker Building, San Francisco, is manager. The installation will include an electric hoist, air compressor, lighting equipment and mill motors.

Thirty-two 25 h.p., 440 volt, 3 phase, 25 cycle, 750 r.p.m. squirrel cage induction motors have just been shipped to the Duluth, Messabe & Northern Ry. Company of Duluth, Minn., by the Ideal Electric & Mfg. Company. The road is a subsidiary of the U. S. Steel Corporation. These motors are for the equipment of the new No. 5 iron ore docks which are reported to be the largest iron ore docks in the world. Each motor will operate a bank of 24 chutes.

The Asbestos Protected Metal Company of Beaver Falls, Pa., is marketing a new form of prepared roofing which they have named Aegisroll, the body or base of which is wool felt impregnated by waterproofing and completely enveloped in a coating of asphalt compound. To the upper surface is attached pure asbestos felt, while the lower surface is protected by a coating of crushed quartz. Both the asbestos and the crushed quartz are embedded into their respective surfaces while the asphalt is hot and are therefore permanently attached. Due to the advancements made by the Asbestos Protected Metal Company in permanently coloring asbestos felt, Aegisroll Roofing can be furnished in a variety of attractive colors, making possible for the first time, artistic combinations between roofs and the color treatment of the building. Booklet and samples sent on request.

SPECIAL TRAIN TO N. E. L. A. CONVENTION FROM PACIFIC COAST.

Plans are now being formulated to send a special train to the thirty-seventh convention of the National Electric Light Association from the Pacific Coast. The convention will be held at Philadelphia, June 1, 2, 3, 4 and 5, 1914. As there is a strong probability that next year's convention can be brought to San Francisco during the Exposition, it is especially desirable that a large and enthusiastic Western delegation attend the Philadelphia convention.

It is hoped to make up a special train consisting of cars from Seattle and Portland, Los Angeles, Salt Lake City and Denver, to join a big delegation leaving San Francisco on May 26. As trains to the N. E. L. A. conventions have always been famous for their fine service and lavish entertainment, this offers an excellent opportunity for any friends of electrical men to have an enjoyable trip East, if they contemplate going about this time. Interested parties can communicate with Mr. E. B. Strong, Pacific Coast master of transportation, at the office of this journal.

BOOK REVIEWS.

National Association of Railway Commissioners—Being the Proceedings of the Twenty-fifth Annual Convention of the Association held at Washington, D. C.; 612 pp.; 6x9 in.; cloth bound. Published by the Law Reporting Company, and for sale by Technical Book Shop, Rialto Building, San Francisco, Cal. Price $1.

This volume should prove an invaluable aid to public utility officials and to others interested in commission control, its attitude, effects, and possibilities. The work of the railway commission is so generally associated with public utilities in general that this report could very satisfactorily and justifiably have been published under a broader title.

Switchgear and the Control of Electric Light and Power Circuits. By A. G. Collis, A. M. I. E. E.; 85 pp.; 4x6½ in.; cloth bound. Published by D. Van Nostrand Company, and for sale by the Technical Book Shop, San Francisco Price 50 cents.

This is the latest addition to a series of Electrical Installation Manuals, nine others on different subjects having been published. This manual deals in elementary terms with the results of practical experience gained during the author's association with switchgear design. Mathematical treatment has been avoided and the subject so dealt with that it is readily understandable. A number of diagrams facilitate this end.

An Elementary Manual of the Steam Engine. By E. C. Lallier; 266 pages; 5½x8 in.; cloth bound. Published by D. Van Nostrand Company, New York City, and for sale by Technical Book Shop, San Francisco. Price, $2.

This text is a practical description of how and why the steam engine works. It begins with a chapter on reciprocating engines, followed by those on governors, engine calculation and the indicator. Then follows treatment of boilers, pumps and Cornish engines. The finishing chapters are devoted to pipes and fittings, rotary engines, internal combustion engines and lubrication. The text and illustrations are clear, so that the average operating man can grasp the fundamental principles of the machinery with which he is in daily contact.

Elementary Magnetism and Electricity. By Cyril M. Jansky, B. S., B. A., associate professor of electrical engineering, University of Wisconsin; 212 pp.; size 6x9 in.; fully illustrated; cloth bound. Published by the McGraw-Hill Book Company, and for sale by the Technical Book Shop, Rialto Bldg., San Francisco. Price $1.50.

This book was prepared in the extension division of the University of Wisconsin. To make the principles real the subject is developed experimentally. This makes the book of especial value to those having practical experience with electrical apparatus, but whose knowledge of the principles of its operation, is limited as in this way it develops the how and why of the apparatus. It is probably the best work of its kind ever placed on the market and is not limited to any particular class of readers.

NEW CATALOGUES.

The P. & H. Excavator is described in a bulletin issued by Pawling & Harnischfeger Company, Milwaukee, Wis.

Bulletin 22-1914, now being distributed by the Century Electric Company, St. Louis, Mo., describes in detail the various styles and types of Century alternating current fans.

Benjamin Friction Drive Screwdrivers, with insulated handles, now constitute a complete line and are listed in a new catalogue being distributed by the Benjamin Electric & Manufacturing Company, Rialto Building, San Francisco.

The Electric Storage Battery Company, Philadelphia, Pa., has just issued Hand Book H X which deals with "Hyray-Exide" Battery and switchboard units, switches, ampere hour meters, and gives prices, terms and directions for ordering

Century, Single-Phase, Self-Starting Motors is the title of a comprehensive booklet (Bulletin 21, Jan., 1914), issued by the Century Electric Company, St. Louis, Mo. It describes fully this company's make of repulsion-induction type of motors.

Electric Fans are dealt with in catalogue 329 of the Sprague Electric Works of General Electric Company, New York. It gives considerable detailed information about this line. Portable Ozonators are described in bulletin 49,000 of the same company.

Electric Lights on Your Automobile is the title of an envelope stuffer being distributed by the Wagner Electric Manufacturing Company, St. Louis. It tells about the Wagner Rectifier for charging storage batteries and gives prices and full particulars.

A comprehensive treatise on Condensers and Auxiliaries, just off the press, is being distributed by the C. H. Wheeler Manufacturing Company, Philadelphia, Pa. It contains 132 pp. and is illustrated with many excellent half-tones and line drawings, which further explain the excellent information with which it is full.

The "Chicago Gatling" Drill (pneumatic) is dealt with in Bulletin No. 152 issued by Chicago Pneumatic Tool Company, Chicago, Ill. The "Chicago Stoper" rock drill is described in bulletin No. 154 of the same company, the No. 5 Chicago Plug & Feather Drill in Bulletin No. 172 and the "Chicago Sinker" for drilling deep holes of large diameter in No. 153.

New Lighting Units is the title of a new bulletin issued by the Holophane Works of General Electric Company, San Francisco. It is devoted to lighting glassware, reflectors, holder sockets and fixtures for use with the new 750 and 1000 watt Mazda (nitrogen filled) lamps, Incidentally, it shows the scientific manner in which these high power lamps should be installed.

Bulletin No. 57, "The Phenix Sight Flow Indicator," issued by The Richardson-Phenix Company of Milwaukee, Wis., describes how this unique device can be inserted in any pipe line carrying a liquid, such as water lines of water cooled transformers and the supply pipes of water jackets of gas engines and air compressors, and how it shows at a glance or indicates electrically by lighting a lamp or ringing a bell when the flow of liquid is interrupted. Several recent improvements in the Sight Flow Indicator are also described.

The General Electric Company recently issued Bulletin No. 45,501, describing that company's Aluminum Lightning Arresters for Alternating Current Circuits. The important features in electrolytic lightning arrester design and embodied first in G-E arresters dealt with. The bulletin consists of thirty-two pages, filled with detailed information relative to these arresters and choke coils for use with them, with notes on the charging operation, installation and ground connections. There are also diagrams and tables of dimensions of both arrester and choke coils. This bulletin supersedes the company's previous bulletin on this subject.

The Manual of Electrical Testing published by the Wagner Electric & Manufacturing Company, St. Louis, Mo., and now ready for distribution, fully justifies its name. It is Bulletin No. 104 of 1914, and contains a general statement of the underlying principles and conditions under which the degree of accuracy of indication and the permanency of calibration are effected in portable instruments. Nevertheless it describes the instruments in detail. The majority of the 48 pages are devoted to General Notes on Electrical Testing. Line drawings are given as an aid to interpreting the text. The booklet is well worth endeavoring to secure.

Bulletin No. A4200, issued by the General Electric Company, is devoted to Strain Insulators and Strain Clamps suitable for insulating and supporting power house wiring and overhead distributing cables and wires. The construction of these insulators and clamps is illustrated and described, and the bulletin contains also catalogue numbers and prices of the various articles. Bulletin No. 44590 supercedes the previous bulletin. The function of the Type ML governor described is to automatically control the operation of either stationary or railway motor driven air compressors in order to maintain air pressure in a storage reservoir between predetermined limits. Bulletin No. 47400 illustrates and describes the Type F, Form K12 Oil Switches. This supersedes a previous bulletin on this subject, and contains up-to-date information on this very important piece of electrical apparatus. Bulletin numbered 45,600 describes Aluminum Lightning Arresters for use in connection with railway signal circuits. It supersedes the General Electric Company's previous bulletin on the same subject.

PUBLICATIONS RECEIVED.

Electric Switches for Use in Gaseous Mines, by H. H. Clark and R. W. Crocker, is the title of Bulletin No. 68 issued by the Bureau of Mines, Washington, D. C.

Preliminary Report No. 2 on Petroleum, issued by the California State Mining Bureau, San Francisco, consists of Notes on Damage by Water in California Oil Fields.

The action of acid mine water on the insulation of electric conductors is dealt with in Technical paper 58 of the Bureau of Mines of the U. S. Government, Department of the Interior.

"The Sampling and Examination of Mine Gases and Natural Gas," from the Bureau of Mines, Washington, D. C., is a 116 pp. paper covered bulletin by George A. Burrell and Frank M. Seibert.

Analysis of Alternating Current Waves by the Method of Fourier, with special reference to methods of Facilitating the Computation, by Frederick Grover, published as Reprint No, 203 from Bulletin of the Bureau of Standards, Vol. 9, Washington, D. C.

Several lectures and papers of the Interstate Commerce & Railway Traffic Course prepared for non-resident instruction of students of the La Salle Extension University have been received. They comprise text books on the organization and operation of the Industrial Traffic department by W. N. Agnew; Statistics of Freight Traffic by Julius H. Parmelee, Ph. D., statistician, Bureau of Railway Economics; Bases of Freight Charges, by C. L. Lingo, and Freight Rates, Official Classification Territory and Eastern Canada by C. C. McCain, chairman, Trunk Line Association.

The report of the Joint Rubber Insulation Committee, recommending a well defined method of procedure in the analysis of rubber for insulation and other uses, has just been reprinted by the Simplex Wire & Cable Company, Boston, Mass. The full report of this committee provides a method of avoiding misunderstandings in connection with rubber analyses, and consists of twenty-four pages. As readers will recall, this report was prepared by a number of interests identified with this subject, including the United States Signal Service and Bureau of Standards, the American Chemical Society, two of the large trunk line railroads and four of the manufacturers of rubber-insulated wires.

NEWS NOTES

FINANCIAL.

SAN FRANCISCO, CAL.—Earnings of the Geary Street Municipal Street Railway during March reached a total of $58,969.50. This exceeds by $300 any previous month, the next biggest being October with $58,663.50. The Union street line reached a total of $29,715.10, which is more than half of the amount earned by the Geary street line, while it is not half the length of that road and did not cost one-sixth of the Geary street system. The total amount earned by the two roads during the month was $88,864.60.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company have filed a mortgage with the County Recorder of Utah county made in favor of the Guaranty Trust Company of New York and William C. Cox as trustee, covering the issue of $100,000,000 worth of 5 per cent first mortgage gold bonds. The mortgage covers every conceivable physical asset of the power company. The purpose of filing the mortgage is to provide for the issuance of the first issue of bonds amounting to $10,000,000, the sale of which has recently been effected by the company. Manager P. B. Sawyer announces that his company has recently negotiated the sale of this issue for the purpose of replacing the short time notes of the Utah Securities Company, which were used in effecting the consolidation of the various companies which the Utah Power & Light Company purchased in Utah, Idaho and Colorado. A part of the proceeds of this bond issue will be used for making contemplated extensions and improvements and for those now in progress. The remainder of the $100,000,000 bond issue will be used from time to time as the financial interests of the company require.

INCORPORATIONS.

SAN LUIS OBISPO, CAL.—Santa Maria Gas & Power Company, $1,000,000, shares $100 each, subscribed, $500, by P. O. Tietzen, T. B. Adam, J. F. Goodwin, J. E. Walker et al.

LOS ANGELES, CAL.—The Niland Water Company has been incorporated with capital of $150,000, by Arthur E. Hull, John R. Woodbridge, D. B. Lyons, E. M. Coplen and Col. R. W. Richardson. The company will begin immediate operations for the development of a water supply for the new town of Niland at the northern end of the Imperial Valley. Reservoirs and settling tanks will be established at once on outskirts of Niland.

SANTA BARBARA, CAL.—A $2,000,000 corporation to provide electric power and lighting facilities for the Santa Ynez Valley, the northern end of the county, and all of San Luis Obispo county, filed articles of incorporation here today, being the Midlands Counties Public Service Corporation. The principal place of business is in Los Angeles. The stock is equally divided between common and preferred, and controlling interest has been secured by the incorporators subscribing $1,000,500. Of this big amount William Kerckhoff and A. C. Balch subscribe $250,100 each; Kaspar Cohn, A. Haas, A. G. Wishon and A. E. Wishon subscribe $125,000 each. The company has acquired the power plants at Santa Maria, San Luis Obispo, Lompoc and other points, and plans for immediate extensions are being made. The new company is a subsidiary of the San Joaquin Light & Power Company. A. G. Wishon, one of the incorporators in the Midlands concern, is general manager of the San Joaquin company. Power will doubtless be supplied by the immense plants of the San Joaquin company in the Sierra mountains.

ILLUMINATION.

LAS VEGAS, N. M.—The town council of West Side has signed a contract with the Las Vegas Light & Power Company for additional street lights.

OAKLAND, CAL.—The county supervisors have granted the Pacific Gas and Electric Company a franchise to lay pipes for supplying gas to residents in Alameda county.

PASADENA, CAL.—The city commission has awarded the contract for installation of an ornamental lighting system on Colorado street from Los Robles avenue to the east city limits, to the Woodhill-Hulse Electrical Company of Los Angeles, for $18,500.

SANTA BARBARA, CAL.—W. A. Brackenridge, vice-president; S. M. Kennedy, secretary, and J. T. Huntington, manager of the Santa Barbara Electric Lighting & Gas Company, held a recent conference with leading ranchers and business men of Carpinteria valley with a view to putting the valley under an electric light and power system. The company proposes to expend $35,000 on the project.

SALT LAKE CITY, UTAH.—The Manufactures' Association of Utah recently installed a unique slogan sign. The sign was first used at the exhibition of Utah products held at Salt Lake City, April 2d to 9th. The sign represents a map of the state of Utah with its principal counties, lakes, rivers, mountains and cities painted on the background. The state border is outlined with incandescent lamps and the words, "I am for Utah" are displayed in raised letters on the face of the sign. The state emblem, a beehive, is also depicted in electric lamps. This sign will be erected permanently in front of the Chamber of Commerce Building, where the Manufacturers' Association maintains an exhibit of Utah products.

TRANSMISSION.

RIVERSIDE, CAL.—The board of supervisors of Riverside county has granted a franchise to the Coachella Valley Ice & Electric Company to construct and operate electric transmission lines over and across public roads and highways in the county.

TERRA BELLA, CAL.—The Mount Whitney Power & Electric Company will erect a substation a mile east of Terra Bella to take care of its increasing business here. The new station will be one of five similar stations to be built this spring, the other stations being at Earlimart, Goshen, Strathmore and Woodville.

SALT LAKE CITY, UTAH.—A canvass of all of the manufacturers exhibiting at the Utah products show given under the auspices of the Manufacturers' Association of Utah in the Keith Building of Salt Lake City, showed that of approximately one hundred manufacturers exhibiting, ninety-one per cent of them used electric power exclusively for the manufacture of their products, the largest user having a maximum load of 2500 kilowatts.

LOS ANGELES, CAL.—The safety commission created by the city council to take charge of the police telegraph and fire alarm system has organized by the election of Councilman John W. Snowden as president and R. H. Manahan, city electrician, as secretary. The other members of the commission are Chief of Police Sebastian and Fire Chief Eley. It was decided to request the budget committee of the council to set aside $250,000 for construction work during the coming year. The work will be done under the supervision of City Electrician Manahan.

TRANSPORTATION.

SACRAMENTO, CAL.—An ordinance requiring the Pacific Gas & Electric Company immediately to double-track the Tenth street line to the baseball grounds has been passed by the city commissioners.

STOCKTON, CAL.—John R. Humphries, G. McM. Ross and Amos Jones resigned their directorship in the Stockton Terminal & Eastern Railroad Company and the United Investment Company at the last meeting. Wm. Nichols Jr. of Berkeley, Chas. Prater of Stockton, and J. A. Stevenson of San Francisco were elected to fill the vacancies.

SAN FRANCISCO, CAL.—The engineering department of the United Railroads has begun work on the extension of its Polk and Larkin streets cross town line to North Point street, a distance of half a mile. The North Point terminus will enable patrons to reach the Van Ness avenue entrance to the Exposition with a walk of a short block.

PORTLAND, ORE.—Application for an interurban car franchise across the new Columbia River bridge and approaches has been made by Isaac W. Anderson, president of the Washington-Oregon Corporation, a Washington concern which operates a street car system in Vancouver and would extend its line to Portland when the bridge is completed.

PORTLAND, ORE.—Application for a 25 year franchise for a complete railway system covering practically the entire East Side and entering the West Side has been filed with Commissioner Daly of the department of public utilities by the Portland & Oregon City Railway, through Stephen Carver, a promoter, who is said to be representing Eastern interests.

FRESNO, CAL.—Following the filing of a petition by John B. Rogers, president of the Fresno Interurban Railway Company, the board of supervisors gave notice that on May 5th it would sell to the highest bidder a 50 year franchise for an electric railroad along the county road on Fresno avenue for a distance of a half mile, or, from the city corporate line to the boulevard.

OAKLAND, CAL.—The new electric train block "foolproof" system, installed by the Oakland, Antioch & Eastern Railway at a cost of $170,000 was given its initial work-out a few days ago. The system extends from Oakland to Sacramento. The system tells the approach of trains, the location of broken tracks, open switches or any possible unnatural condition of the roadway.

RICHMOND, CAL.—The San Francisco-Oakland Terminal Railways Company has made a lively start on its development program in Richmond. With hardly any preliminary announcement, it has begun unloading rails and ties for the double-tracking of its lines on Macdonald avenue and Twenty-third street. Contracts have been let for the work. This is the first important construction work undertaken by the street railway corporation since its refinancing.

SAN FRANCISCO, CAL.—Final action has been taken in the matter of the removal of street railway tracks in the civic center, being those tracks now operating on Polk street, Grove street and City Hall avenue. The United Railroads has agreed to the removal of these lines of traffic and the transferring of cars to Hayes, Larkin and McAllister streets. At the same time preliminary steps were taken to secure the removal of certain tracks in Stockton street to make way for the proposed municipal line in that street.

FRESNO, CAL.—Negotiations are under way between property owners southeast of Fresno and the Fresno Traction Company for the construction of an interurban line to Calwa, a distance of about three miles. A proposition from the property owners was presented to Paul Shoup some time ago. The route of this new interurban line has not yet been definitely determined, but it is asserted that it will leave the city from the Recreation Park line. The Calwa line will branch off the Recreation Park line near the car barns of the traction company.

OAKLAND, CAL.—Stockholders of the San Francisco-Oakland Terminal Railways have voted to increase the bonded indebtedness of the company from $20,000,000 to $35,000,000 subject to the approval of the State Railroad Commission, and to issue new securities to be known as "first and refunding 35 year 5 per cent gold bonds." Of the new issue $20,000,000 will be set aside for refunding the old bonded indebtedness. Part of the $15,000,000 remaining will be used "to acquire property within the purpose of the corporation and for the extension and improvement of its facilities and the improvement and maintenance of its service."

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has awarded to the Westinghouse company contracts for motor generator sets of an aggregate capacity of 6000 kw. to be delivered in San Francisco before July 15, and to be installed for the operation of the municipal street railway lines now under construction. The Pacific company is already supplying electric power to the Geary street line, which forms the nucleus of San Francisco's rapidly expanding network of street railways. This company is at the present time supplying the power for the operation of 639 miles of city and interurban electric railways, including the Southern Pacific Company's lines in and about San Jose, the Oakland Traction Company and the Northern Electric Railway Company.

TELEPHONE AND TELEGRAPH.

NEWPORT, CAL.—Bids will be received up to May 4th for a franchise to construct telephone and telegraph wires in this city.

HILO, T. H.—The telephone company is preparing to do some general repair work on its country lines and has ordered 1150 poles from the Hilo Mercantile Company.

LOS ANGELES, CAL.—The Los Angeles District Telegraph Company has been granted a franchise to construct and operate for a period not to exceed 21 years, a district messenger signal system in this city.

ESCONDIDO, CAL.—L. Montgomery, installer for the Pacific States Telephone & Telegraph Company, is arranging for the installation of additional equipment in the way of another toll line between Escondido and Vista, work is to begin at once.

GARDNERVILLE, NEV.—The residents of Diamond Valley have made arrangements with the Farmers' Telephone Company for connections and the lines are to be extended to that section in the near future. The residents of the valley have agreed to stand the cost of construction.

WATERWORKS.

PULLMAN, WASH.—The city council has instructed the city clerk to advertise for bids for pipes, fittings, pumps, etc., for the $25,000 improvements to the water system.

THREE FORKS, MONT.—The city council has called a special election for April 23, when the city will vote on issuing $45,000 worth of bonds for a municipal water system.

LEWISTOWN, MONT.—Bids will be received until May 11, for the purchase of $60,000 worth of water bonds of the city of Lewistown, for the purpose of reconstructing the water works system.

MONTAGUE, CAL.—The town trustees have awarded the contract for the installation of their municipal water system, with the exception of the pumping plant to C. D. Vincent of Oakland, for $20,700.

BOLINAS, Cal.—The powerful new wireless stations of the Marconi Company at Bolinas and Marshall bays are about completed, and within three weeks the local operators will be sending and receiving long distance messages. All that remains is the completion of the Honolulu station.

LEWISTOWN, MONT.—The election held to vote on the $90,000 water bond issue carried. The proceeds will be used in continuing the iron water works system up Spring creek. The city will advertise for bids for the bonds and it is expected that they will be sold in May, and the pipe laying will begin about May 20.